

Standards Committee T1

Carrier Liaison Committee

Telecommunications
Industry Forum

Ordering and Billing
Forum

Network Interconnection
Interoperability Forum

Industry Numbering
Committee

Protection Engineers
Group

Standards Committee O5

Network Reliability
Steering Committee

Internetwork
Interoperability Test
Coordination Committee

Telecommunications
Fraud Prevention
Committee

Generic Requirements
Users Group

International Forum on
ANSI-41 Standards
Technology

Interactive Voice
Response Forum

TTY Forum

Administrative Council for
Terminal Attachments

IMSI Oversight Council

July 12, 2002

VIA HAND DELIVERY

Marlene H. Dortch, Secretary
Office of the Secretary
Federal Communications Commission
445 12th Street, SW, Room TW-A325
Washington, DC 20554

Re: TTY Forum's Aggregate Report of Carriers
for 2nd Quarter 2002, CC Docket No. 94-102

Dear Ms. Dortch:

Enclosed are an original and four copies of the TTY Forum 22 Meeting Summary. Appendix L contains an aggregate report of wireless service providers, handset and infrastructure manufacturers for 2nd Quarter 2002 filed on behalf of ATIS' sponsored TTY Forum and in response to the Commission's Fourth Report and Order in the above-captioned case. Please date-stamp and return the enclosed extra copy of this filing to our messenger.

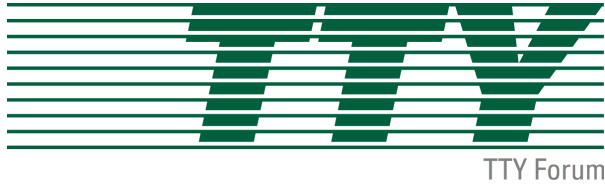
Please contact me at 202/434-8830 if you have any questions or comments.

Sincerely,

Toni E. Haddix
Staff Attorney

Enclosures

cc: Barry Ohlson, Chief, Policy Division, WTB
Pamela Gregory, Director, Disabilities Rights Office, CGB
Mindy Littell, Attorney Advisor, Policy Division, WTB



TTY Forum – 22

Meeting Summary Report

June 4, 2002
ATIS Conference Center
Washington, DC

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TTY/TDD Forum – 22

June 4, 2002

ATIS Conference Center

1200 G Street, NW, Suite 500

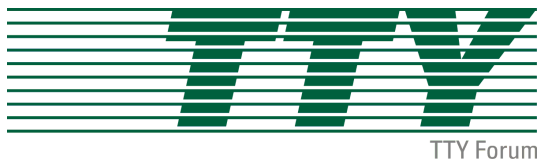
Washington, DC

Agenda

Chaired by Steve Coston, Sony Ericsson

1. Call to Order, Introductions and Attendance Roster
2. Call for and Numbering of Contributions
(All Contributions will be numbered as follows: TTY22/02.06.04.XX)
3. Review & Approve Agenda
4. TTY Forum #21 Summary
5. TTY Correspondence and Liaison Reports: *FCC; CTIA; NAD; TDI; NENA; ATIS*
6. Review TTY Forum #21 Agreements and Action Items
7. Technical Activities
 - a. TTSI Report
 - b. Review draft contribution to TR30.1: Proposed Change to TIA/EIA 825
8. Industry Implementation Status Reports:
Importance Notice to all stakeholders: *Given that this is the final TTY Forum before the implementation date of June 30, 2002, please be prepared to announce, explain and or discuss, your company's/organizations positions, level of readiness and or options for meeting the deadline.*
9. *Consensus Statement for the FCC:* An effort will be undertaken at this TTY Forum to agree, in principle, to a common message that can be sent to the FCC and industry as a whole that reflects the status / level of readiness: The following PROPOSED text can be used to initiate discussions.

Following five years of dedicated technical research, design development and functional testing the stakeholders represented by the TTY Forum are pleased to announce....
10. Next Meeting
 - Conference Call to approve message to the FCC
 - Tuesday, September 17, 2002
11. Adjournment



Meeting Summary

1. Call to Order, Introduction and Attendance Roster

Steve Coston, Sony Ericsson, Acting Chair, called the meeting to order at 9:05 a.m. He thanked all the participants in attendance for their participation, and explained that Ed Hall, Chair, would be unable to attend today's meeting. All participants took the opportunity to introduce themselves.

2. Call for and Numbering of Contributions

Mr. Coston introduced all contributions, and asked for any additional contributions. All contributions provided to the Secretariat electronically are available for download on the TTY Forum web site at <http://www.atis.org/atis/tty/documents>, or by sending a request to Megan Hayes (mhayes@atis.org). Contributions were submitted and numbered as follows:

Number	Title
TTY22/02.06.04.01	Agenda
TTY22/02.06.04.02	Roster
TTY22/02.06.04.03	TTY 21 Meeting Summary
TTY22/02.06.04.04	TTY 21 Agreements and Action Items
TTY22/02.06.04.05	TTSI Report to TTY Forum #22
TTY22/02.06.04.06	TR-30.1 Contribution
TTY22/02.06.04.07	Ericsson Infrastructure Status Report

3. Review and Approve Agenda

The agenda was distributed and one change was made moving the Review of the draft Contribution to TR30.1 prior to the TTSI report. The agenda was approved as modified.

4. TTY Forum #21 Summary

Mr. Coston asked if there were any suggested modifications to the TTY Forum #21 Meeting Summary. There were none and the document was accepted as final.

5. TTY Liaison Reports

NAD (National Association of the Deaf)

David Nelson expressed concern that small carriers were planning to file for waivers with the FCC to extend the June 30, 2002 deadline. He also explained that deaf individuals purchasing cell phones have informed NAD that some salespeople had no knowledge of TTY capabilities. In addition, some deaf consumers had informed NAD that a number publicized as a TTY number was not a TTY number, thus lengthening the process for

receiving necessary information. Mr. Nelson stressed the importance of having a trained sales force and the need for TTY customer service numbers to be widely available and publicized. Mr. Coston echoed these statements, noting the importance of consumer education and awareness.

CTIA (Cellular Telecommunications and Internet Association)

Andrea Williams asked about the current status of the concerns brought to the FCC regarding Public Service Answering Points (PSAPs) (Note: This is regarding a letter sent from the TTY Technical Standards Implementation Incubator (TTSI) to the FCC in February 2002). Mr. Coston asked if the FCC would take the time to address this during their liaison report. Jim Schlichting responded that he would address this question.

FCC (Federal Communications Commission)

Mindy Littell introduced the FCC participants in attendance today, and expressed her interest in hearing the upcoming industry status reports. She noted that roughly 30 companies have filed requests for a waiver of the June 30, 2002, date, and she explained that these requests are predominately for limited waivers of three to six months in a specific location. In some cases she noted that the waiver is being requested by small TDMA carriers looking to switch to a new air interface in light of larger carriers switch to GSM.

Jim Schlichting, FCC, noted the importance of the June 30, 2002 deadline, and reported that the FCC has received a mostly positive response from the industry meeting this deadline. He reported to the TTY Forum that the FCC had been approached regarding the high error rates resulting from tests involving PSAPs, he noted that it was suggested that the FCC issue a public notice regarding this matter. Mr. Schlichting explained that the FCC is considering this matter and no final decision has been made regarding any action, but that some form of public notice or consumer notice would most likely be appropriate. He noted that, ideally, any bulletin from the FCC would be issued before July 1, 2002. Mr. Schlichting explained that, for the long term, this problem should be addressed and not allowed to progress any longer than necessary. The FCC is working with this Forum and the industry to alleviate the problem. He expressed his appreciation to the TTY Forum and the TTSI for all of their efforts toward the resolution of this issue.

Ms. Williams asked if coordination efforts had begun regarding the dissemination of information to consumers regarding TTY accessibility. Mr. Schlichting noted that work had begun on a public bulletin.

Mr. Nelson expressed his concerns about the ability for consumers to assess the situation within the PSAPs. Mr. Schlichting agreed with this concern and noted the importance of this issue. He informed the Forum that the FCC had no jurisdictional authority over PSAPs, and they can only approach the issue via consumer information and education. Through these methods, he said, the awareness level would be raised at the PSAPs. He stressed the importance of having public safety representatives aware of the problems, and gaining their assistance to correct the problem. Judy Harkins, Gallaudet University, noted the difficulty of advocacy of this issue on the local level, and suggested that

perhaps the FCC could query the Department of Justice on this matter, as they have jurisdiction over PSAPs.

Mr. Schlichting noted that updated testing information would be important to the FCC, and the FCC would consider any updates from the TTY Forum or the TTSI for inclusion in any future public notice. Several participants noted the importance of balancing the flow of immediate, less detailed, information, and the long-term dissemination of detailed information. Mr. Nelson commented that many in the deaf and hard-of-hearing community check their association web sites, rather than sites like the FCC, when searching for information. It was noted that it would be important for the industry to send the same information to consumers, and it was recommended that web site links to the FCC web page be widely used to disseminate information. Cary Barbin, Gallaudet University, suggested that the FCC take the individual language use abilities of deaf consumers while drafting any bulletin targeted to the deaf community.

6. Review TTY Forum #21 Agreements and Action Items

Mr. Coston reviewed all agreements and action items from the TTY Forum #21. He detailed where these items would be reviewed in the agenda. Megan Hayes, ATIS, reported that a press release had been distributed regarding the use of the TTY symbol on the packaging of TTY compatible equipment. There were no further comments submitted on these items at this point.

7. Technical Activities

7a. Review of draft contribution to TR30.1

Dick Brandt, Gallaudet University, presented Contribution TTY22/02.06.04.06, a draft contribution to TIA's TR30.1 regarding problems discovered in ITU-T Recommendation V.18, which were also included in ANSI TIA/EIA-825. The document defines a problem caused in interworking between these implementations and existing TTYs over digital wireless connections. The contribution proposes a change to the text to the ITU-T, and opening a project to remove the corresponding text from ANSI TIA/EIS-825. Some suggestions were made to strengthen the statements in the recommended text, and Mr. Brandt indicated he would make the appropriate changes before presenting the contribution to TR30.1.

Action Item: Dick Brandt will edit Contribution TTY22/02.06.04.06 and send it to Megan Hayes for contribution to TR30.1

Agreement Reached: Contribution TTY22/02.06.04.06 will be sent, as edited by Dick Brandt, to TR30.1.

7b. TTSI Report

Jim Turner, ATIS, presented Contribution TTY22/02.06.04.05, the TTSI report to TTY Forum #22. He noted that the TTSI has been a precedent-setting collaboration of industry players gathering to solve a specific issue. His report addressed several areas of testing in TTSI, some issues are still in progress and some issues have been closed.

Blaise Scinto, FCC, asked if any of the tests the TTSI used could be used by an end-user as a diagnostic tool to identify problems with a PSAP. Mr. Turner noted that there were test procedures trialed by users, and full reports were produced and returned to the users. He noted that the consumer would not find the diagnostics as useful for diagnosing a problem with a PSAP since the focus of the test is to solve potential consumer problems with the TTY device, not to diagnose problems originating from the PSAP.

8. Industry Implementation Status Reports

Mr. Coston noted that Ericsson submitted a written report, and that verbal reports would be accepted from other participants. He noted written submissions to the FCC through the TTY Forum should be sent to Megan Hayes, TTY Forum Secretariat, by July 10, 2002. 5 p.m. Eastern Time. Reports should be e-mailed to mhayes@atis.org in Microsoft Word Format.

Nextel

Bob Montgomery reported that Nextel would be ready by June 30, 2002. Currently, there are 19 out of 22 markets complete for infrastructure and the rest to be complete in the next week. He noted that Nextel had five TTY handset models ready for sale.

Cingular

Ken Evans reported that Cingular scheduled deployment for the end of June 2002. He noted that their network switches could now be made without the loss of any circuit switch data. He reported that documented testing was occurring at each switch and 65% were currently complete with June 28, 2002 as the target date for the completed testing. He thanked the vendors for all of their work with the carriers on this issue.

Mr. Evans also reported on a trial that was conducted with nine TTY users from Gallaudet University, and that several consumer issues had already been discovered. He noted that many more discoveries would probably be made after complete roll-out. He thanked Gallaudet University for their assistance in the testing process.

Mr. Evans informed the TTY Forum that Cingular had begun the process of training their sales staff and updating their web sites to help educate employees and consumers. He added his concern about the status of the PSAPs, and noted that Cingular is open to any suggestions as to how the industry can help mitigate the problem.

VoiceStream

Roy Richmond noted that VoiceStream uses hardware from three vendors, and despite some issues encountered through one vendor, roll-out is continuing and expected to be complete by June 21, 2002. He noted that VoiceStream used the Gallaudet University scoring program for their tests, and that VoiceStream is working on a test kit to be deployed in different markets. He explained that two different handset options are being evaluated.

AT&T Wireless (AWS)

Lori Buerger reported that AWS utilizes two air interfaces: TDMA (the company's existing national network) and GSM (the company's new network, currently being developed), with multiple infrastructure vendors for each air interface. She noted that multiple handsets are available for the TDMA interface, and that a GSM handset will be available by June 30, 2002. She noted that deployment of TTY compatibility on the TDMA infrastructure would be complete, for all vendors, for the June 30, 2002 date. The GSM infrastructure was encountering a finite delay with a single infrastructure vendor (of three total), and AT&T would be filing with the FCC for a brief extension for that one infrastructure vendor's equipment, on the single air interface. She noted that this issue should not impact customers because the complete timely compliance of TTY deployment in the company's national TDMA network TDMA will be able to fully meet the needs of customers seeking TTY-digital compatibility.

Sprint PCS

Scott Freiermuth reported that Sprint PCS works with a CDMA based network, and he noted that the infrastructure has been up and functional since May 15, 2002. He reported that Sprint expected to launch nine, if not more, handsets, with some already available on the market. There had been some handset bugs, but at this point they had all been resolved. He noted that internal support and training was in place and ready for deployment, and he added his concern about the PSAP issue.

Mr. Freiermuth reported that barring any unforeseen obstacles, Sprint PCS was ready to deploy.

Ultratec

Ron Schultz reported that Ultratec was manufacturing a Compact C model to be compatible with digital technology. Ultratec has eliminated the Baudot interrupt feature, incorporated the new logo into their packaging, and included new consumer instructions with their products. Ultratec is communicating with their sales force to instruct them on digital wireless compatibility, and have updated their web site to include a list of TTY compatible handsets. When asked if it was possible to provide the Forum with the information from the web site, Mr. Schultz noted that it was on the public Ultratec web site (<http://www.ultratec.com>). He noted that Ultratec would also be making an upgrade available to the existing Compact C unit.

Ericsson

Amy Johnson presented Contribution TTY22/02.06.04.07, Ericsson infrastructure status report. Ms. Johnson reported that Ericsson would be ready for deployment on all air interfaces (CDMA, TDMA and GSM) by the June 30, 2002 date.

Motorola

Al Lucas reported that Motorola is on schedule for deployment on June 30, 2002. He reported that Motorola has roughly nine handset models available for deployment over three air interfaces, with several more on the horizon.

Mr. Lucas also noted that this would be his last time attending the TTY Forum, as he would be retiring on June 28, 2002. He expressed his pleasure at participating in the TTY Forum, and he noted that it was an outstanding example of the industry working together. The participants in the TTY Forum gave Mr. Lucas a warm round of applause.

Sony Ericsson

Matt Kaltenbach reported that Sony Ericsson has handsets available for three air interfaces. TDMA handsets will be released prior to June 30, 2002, and GSM handsets are currently available through the Sony Ericsson Special Needs Center. Extensive conformance testing had occurred with the CDMA handsets, and the issues have been communicated to Qualcomm for patch code evaluation and parameterization.

Nokia

Chris Wallace reported that Nokia has produced handsets for TDMA, CDMA, GSM and multi-mode phones, and although there have been some issues with the S10 model, Nokia is committed to the completion date sighted by the carriers.

9. Consensus Statement for the FCC

The participants of the TTY Forum discussed the reasons for creating this document, and the best way of producing it. It was agreed that a consensus statement to the FCC would be important to demonstrate all that the TTY Forum had accomplished. It was determined that the Secretariat would draft the document based on some main points supplied by the Forum, and the document would then be reviewed by the forum via e-mail prior to being sent to the FCC.

S. Coston explained to the Forum that based upon the recent status reports given the Wireless Industry considers the Development Phase of TTY Compatibility to be Closed. Products are now in the Production Phase of the Plan and are moving into early launches through efforts of both the Wireless Manufacturers and Carriers. Released products for the Production Phase will progress through its cycle encompassing stronger field use by consumers, evaluation and feedback mechanisms channeled through Customer Service Departments that ultimately influence future designs of products. Effective support and handling of these feed-back mechanisms while in the Production Phase are typically referred to as Maintenance updates. It was agreed by all Wireless Industry that Digital Wireless TTY Compatibility has now moved into a Production Release and Maintenance Phase for all future changes.

Agreement Reached: The TTY Forum will send a consensus statement to the FCC that reflects the readiness of the industry for TTY deployment over the digital wireless network by the June 30, 2002 deadline.

Action Item: The Secretariat will draft a consensus statement for the FCC and distribute it to the members of the TTY Forum by June 18, 2002 for their consideration. The participants will submit their comments by June 25, 2002, and the Secretariat will forward the final document to the FCC.

10. Next Meeting

The next meeting of the TTY Forum was scheduled for Tuesday, September 17, 2002, in the ATIS Conference Center, Washington, D.C.

11. Adjournment

Mr. Coston declared the meeting adjourned at 3:03 p.m.

TTY – 22
Meeting Roster
June 4, 2002
Washington, DC

Name	Company	Phone	Fax	Email
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Cary Barbin	Gallaudet	202-651-5000		cary.barbin@tap.gallaudet.edu
Dick Brandt	Gallaudet University	908-730-8373		dbcon@att.net
Bill Breslin	ATIS	202-662-8667	202-393-5453	wbreslin@atis.org
Lori Buerger	AT&T Wireless	312-258-2906	312-441-2025	lori.buerger@attws.com
Steven Coston	SEMC	919-472-7527	919-472-6105	steve.coston@sonyericsson.com
Bryan Davis	Compu-TTY, Inc.	817-738-2485	817-738-1970	bdavis@computty.com
Linda Day	AT&T Wireless	559-438-2485	559-438-5713	linda.day@attws.com
Ken Evans	Cingular	404-713-8888		ken.evans@cingular.com
Patrick Forster	FCC	202-418-7061	202-418-7247	pforster@fcc.gov
Scott Freiermuth	Sprint PCS	913-315-8521		sfreie02@sprintspectrum.com
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Megan Hayes	ATIS	202-662-8653	202-393-5453	mhayes@atis.org
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Chris Wallace	Nokia	972-894-4947	972-894-5525	chris.wallace@nokia.com
Lee Whritenour	Verizon Wireless	908-306-6485	908-306-6489	lee.whritenour@verizonwireless.com
Andrea Williams	CTIA	202-736-3215	202-785-8203	awilliams@ctia.org

The following companies submitted their TTY Implementation Status Reports for the second quarter of 2002 through the TTY Forum, but did not attend TTY Forum #22.

APPENDIX A

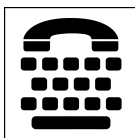
Agreements and Action Items

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 22

- 22.1** Dick Brandt will edit Contribution TTY22/02.06.04.06 and send it to Megan Hayes for contribution to TR30.1
- 22.2** Contribution TTY22/02.06.04.06 will be sent, as edited by Dick Brandt, to TR30.1.
- 22.3** The TTY Forum will send a consensus statement to the FCC that reflects the readiness of the industry for TTY deployment over the digital wireless network by the June 30, 2002 deadline.
- 22.4** The Secretariat will draft a consensus statement for the FCC and distribute it to the members of the TTY Forum by June 18, 2002 for their consideration. The participants will submit their comments by June 25, 2002, and the Secretariat will forward the final document to the FCC.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 21

- 21.1** Megan Hayes will compare the contribution from Gunnar Hellstrom regarding 3GPP standards and compare it to Appendix J. She will also compare the list from Dick Brandt, Gallaudet University. The complete list will be included with the Meeting Summary for TTY Forum #21.
- 21.2** Ed Hall, ATIS, will inform the TTY Forum of the outcome of the meeting with the FCC and will distribute the power point presentation made at the FCC.
- 21.3** The telecommunications industry should use a consistent symbol to indicate that a handset will work with a TTY. Specifically, the internationally recognized TTY symbol or some modification of it should be used.



AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 20

- 20.1** Line Item #13 in the User Intervention Document regarding the usability of a device in an “eyes-busy” environment will be removed.
- 20.2** Line Item #7 in the User Intervention Document will be changed to the following wording: “Does the TTY mode setting interfere with the operation of other features of the handset system?” (e.g., does connecting the cable or enabling the TTY mode disable the vibrate feature or the direct dialing capability?)
- 20.3** SHHH and Gallaudet University will assist the TTSI Incubator in VCO/HCO testing and consumer trials. The TTSI Incubator will determine how to move forward with VCO/HCO testing and consumer testing in the Washington, DC area.
- 20.4** Verizon Wireless will find the standard that addresses the physical requirements of the 2.5 mm jack and provide the information to the TTY Forum for inclusion in Appendix J. This information will also be provided to TR45.1.
- 20.5** The Terminal Product Labeling group will be closed.

20.6 The Terminal Product Identification Committee Working Group of the TTY Forum will be formed to work the labeling issue and bring a recommendation back to the TTY Forum Plenary. The group will be Chaired by Jim House, and include as members: Beth Wilson, Susan Palmer, Al Lucas, Matt Kaltenbach, David Nelson, Ron Schultz, Chris Wallace, Peter Lee, Linda Day, Lee Whritenour and Scott Freiermuth.

20.7 TTY Forum – 21 will be held March 5, 2002 at the ATIS Conference Center in Washington, DC.

20.8 TTY Forum – 22 will be held June 4, 2001 at the ATIS Conference Center in Washington, DC.

20.9 The topic of Roll-Out Guidelines and Considerations will be turned over to the TPI Working Group for exploration. The resulting suggestions will be included as an appendix in the next meeting summary.

20.10 Ed Hall will extract information regarding non-initialized phones and 911 calls from previous meeting notes.

20.11 The Manufacturers will provide information to the TTY Forum regarding the behavior of 911 TTY calls in a non-activated SIM terminal.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM – 19

19.1 The TTY Forum Chair will communicate to the TTSI Incubator Group that there should be a white paper written identifying the problem with SMS messaging tones with TTY. The white paper should also address any other features that use auditory alerts and may cause higher character error rates.

19.2 The TTSI Incubator Group should plan to include testing during high-traffic hours.

19.3 TTY Forum participants agreed to use Gallaudet University's testing script version 1 (1.1) for all FOA type testing, and to continue to use Lober and Walsh for all lab testing.

19.4 The consumer community will review line item #13 in the TTY User Intervention Document (Appendix E) regarding "Is it usable in an "eyes busy" environment" and re-state it, if needed, to clarify confusion.

19.5 Line Item #7 of the TTY User Intervention Document (Appendix E) will be reviewed and edited off-line by Gallaudet to cover the interference of TTY with other phone features, including dialing.

19.6 The Voice Mail Recommendations will be passed on to the IVR Forum for their review, via a liaison from the TTY Forum.

19.7 The revised Appendix E of the TTY Forum Meeting Summary was approved as revised.

19.8 There will be a TTY Forum Working Group to address drafting guidelines for the industry on labeling equipment to indicate that it is TTY Compatible (members will include: Beth Wilson, Chair, Al Lucas, Matt Kaltenbach, Chris Wallace, Ken Evans, Jim House, David Nelson, Linda Day, Ron Schultz and Al Sonnenstrahl).

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM – 18

18.1 Contribution TTY18/01.06.12.13, "Testing Against User Requirements" will be added to Appendix D: TTY Test Completion Matrix of the TTY Forum Meeting Summary.

18.2 The Secretariat will add contribution TTY18/01.06.12.13, "Testing Against User Requirements" to Appendix D: TTY Test Completion Matrix of the TTY Forum Meeting Summary.

18.3 Judy Harkins will provide the URL for the web site describing the testing tools technology to the TTY Secretariat to make the information more readily available to TTY Forum participants.

18.4 The list of questions regarding user intervention (Contribution TTY18/01.16.12.15), will be considered for further discussion of user intervention.

18.5 The product labeling issue will be deferred until the next TTY meeting due to time constraints.

18.6 Regarding Features and Functions:

CALL WAITING (CW)

CW interferes with TTY communications.

CW as a feature is disruptive and often not used by TTY users. Disabling CW by default for phones in TTY mode is an acceptable solution to the consumer community.

CW can be disabled in a GSM environment (either permanently or via the handset menu).

CW cannot be disabled via the handset menu in a TDMA environment; it has to be disabled at the switch.

VOICEMAIL/TTY MAIL (VM)

Some systems do not record and play back to TTY machines as well as others.

VM should be placed on the next TTY Forum agenda and referred to the AVSS/IVR Forum.

SHORT MESSAGING SERVICE (SMS)

SMS signals may cause interruption in TTY communications.

SMS is a desired feature for the consumer community.

Queuing of SMS messages during a TTY conversation is not supported in some networks.

18.7 Elizabeth Lyle will submit a written proposal for a consolidated report for submission to the FCC. This report will be posted to the TTY Forum web site.

18.8 The next meeting of the TTY Forum (#19) will be held September 26 at the ATIS Conference Center in Washington, DC.

18.9 TTY Forum #20 will be held December 11 at the ATIS Conference Center in Washington, DC.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 17

17.1 The TTY Forum recognized ATIS as its Secretariat and official sponsor.

17.2 Ericsson, Lucent, and Nokia will look into the voice quality issue in terms of IS 127-2 CDMA and TDMA and report back to the TTY Forum whether or not there is a problem.

17.3 Consumer groups will review the “user intervention” handset function and report back at the next TTY Forum on whether or not the function is considered a viable option.

17.4 It was agreed to disband the E-Protocol Working Group.

17.5 It was agreed that the TTY Forum would file an ex parte to the FCC to report the solution proposed by the E-Protocol Working Group and the action taken by the TTY Forum.

AGREEMENTS FROM TTY FORUM — 16

16.1 TTY Secretariat, Megan Hayes, will add a non-attending participants list of those who submit implementation status reports to the chair but were unable to attend the TTY Forum

16.2 The industry implementation status reports will be added as an appendix to the meeting summary (Appendix L). All written reports will be sent to the chair within ten working days following the forum. This agreement will be sent out the list serve to ensure that all TTY

participants (past and present) are aware of the agreement. The final Meeting Summary will be submitted to the FCC and will become public record.

16.3 TTY Forum industry members find that it is not within the scope and purview to address the e-protocol issue at this time. However, the chair will pass the concept and recommendation to SDO's (e.g. T1P1, TR45)

16.4 A working group will be created to explore the e-protocol issue. There will be an effort to ensure that all industry sectors are represented.

AGREEMENTS FROM TTY FORUM – 15

15.1 Toni Dunne, NENA, will be the principle point of contact for coordinating with PSAPs at a point in carriers, infrastructure, and mobile handset vendors field testing.

15.2 The TTY Forum will hold its next meeting on October 24, 2000 (second choice is October 25, 2000) at Gallaudet University. Meetings thereafter will be held on an "as needed" basis. The summary of the report from the October 2000 meeting will be formally forwarded to the FCC with a cover letter written by the Co-Chairs. Furthermore, on a voluntary effort, carrier will post a status update on their Website and/or the TTY list serve on 3/01, 9/01, and 3/02.

AGREEMENTS FROM TTY FORUM – 14

14.1 Establish Appendix J which will be a "living" document of technical terms and organizations and Appendix J, also a "living" document of technical standards development essential to the TTY Forum's Scope.

AGREEMENTS FROM TTY FORUM – 13

13.1 Lucent announced they will distribute the TTY vocoder solution, royalty-free, to mftrs implementing the solution. Lucent noted that it is not relinquishing the patent rights, just making the solution available royalty-free.

AGREEMENTS FROM TTY FORUM – 9

9.1 The TTY Forum agrees to submit User Requirements to TR45 in December, 1998.

9.2 Appendix G will be created as a living document to identify membership of the TTY Forum Test Procedure Study Group that will meet to track test plan modifications, facilities, and dates, user expert, point of contact.

9.3 Appendix H will be created to identify the operational characteristics of TTY devices.

9.4 The TTY Forum will develop a list of TTYs that fall within the domain of reasonable operational characteristics to provide an informational guide for carriers. The list will be available to the public via web sites and mailings.

9.5 The TTY Forum agrees that IWF is broadly defined as a translation method to complete a call that is transparent to the user. The IWF is not limited to either voice or data. An IWF may not be confined to a single network but may be shared across multiple networks.

9.6 The TTY Forum agrees to submit the SRD for the 2.5 mm Jack to TR45 in December, 1998.

9.7 The TTY Forum agrees to submit the SRD for Circuit Switched Data to TR45 in December, 1998

AGREEMENTS FROM TTY FORUM – 8

8.1 The TTY Forum agrees that all testing will be done in test labs simulating field conditions.

8.2 The TTY Forum agrees that the short-term solution will now be referred to as voice-based solutions. The long-term solution is now referred to as data based solutions.

8.3 An experienced TTY user will be available at the beginning of lab testing to provide counsel or training, if necessary.

AGREEMENTS FROM TTY FORUM – 7

7.1 The TTY Forum should remain operational until solutions are provided and implemented for all digital technologies, to the satisfaction of the TTY Forum.

7.2 The baseline for the digital solution is wireless analog performance.

7.3 Accept Contribution #12 as a working document to represent the basis of the test plan. Test Plan as modified by the technology groups (CDG,UWCC,GSMNA) will be sent to all phone manufacturers. Test plan will measure the performance of various digital air interface technologies.

7.4 Where possible, VCO/HCO should be included in the testing, design, and availability of TTYs, cellular phones, and air interface technologies.

7.5 The TTY Forum will submit a request for a three month extension to the FCC.

AGREEMENTS REACHED AT TTY FORUM - 6

6.1 Any carrier not in compliance with the Consumer Notification Process established at TTY Forum should be brought to the attention of the TTY Forum for resolution.

6.2 Working Group #1 is officially dissolved having completed its initial charter. Any further testing results would be forwarded directly to the TTY Forum.

6.3 A lack of TTY technical standard has resulted in a variance of TTY performance levels manifested when used on digital networks. As such, in developing the “short-term” digital solution, certain least used models of TTY may not be supportable on all digital air interfaces.

AGREEMENTS REACHED AT TTY FORUM - 5

5.1 As an initial step, carriers who can offer TTY users at least one digital phone model for each digital technology that a carrier offers at a reasonable price by October 1, 1998 would be considered in compliance of the E9-1-1/TTY compatibility requirements.

5.2 The FCC can use the information contained in the notification letter in any way they feel would expedite getting the information to the consumer.

5.3 All test results submitted will be included in the next Quarterly Status Report.

AGREEMENTS REACHED AT TTY FORUM - 4

4.1 Objective test (Throughput Test) approved and to be sent to manufacturers and carriers with a matrix to record testing completion dates and documentation.

4.2 TTY Forum Test Completion Matrix approved.

4.3 Consensus reached that Testing Matrix should go to every manufacturer listed at CTIA as well as Wireless and Wireline Carriers. CTIA/PCIA will escalate/elevate TTY Forum efforts to reach wireless equipment manufacturers and inform of urgency and criticality of rapid response to the Testing Matrix via a letter from the TTY Forum and CTIA/PCIA. The group recognizes that participation is voluntary. Copies of letter and matrix responses will be sent to the FCC.

4.4 RFI will be put on issues list to explore possibility of interference between phone and TTY device.

4.5 Consensus to put TTY Forum's current research opinion on output voltages (coupling information) into a formal document and present to manufacturers for feedback. Give 30 days for feedback.

4.6 Subjective test (End User Test) to be finalized by committee. Testing will be handled through Gallaudet with assistance from Wireless manufacturers and TTY manufacturers. Will replicate authentic 9-1-1 calls with a deaf/hearing impaired caller and a trained calltaker.

4.7 CTIA will produce a list of Analog Phones that are compatible with TTY devices to be included in notification efforts and on web sites due as a Contribution at the next TTY Forum.

4.8 Gallaudet University and Consumer groups will draft a Consumer Requirements Document due as a Contribution at the next TTY Forum.

4.9 CTIA/PCIA will send letter to wireless equipment manufacturers requesting that they support Gallaudet University in their testing efforts by sending equipment.

4.10 Standards Requirements Documents (SRD) due for V.18 and the 2.5 mm jack as Contributions at next TTY Forum.

AGREEMENTS REACHED AT TTY FORUM - 3

3.1 6 sponsored spots for identified consumer groups, relinquished if member misses 2 consecutive meetings.

3.2 Accept modified "readability test" to be used by phone manufacturers to benchmark TTY over digital capabilities, to determine success rate for transport. (See Contribution TTY/98.02.11.06) Two tests: Manufacturers Readability Test, End User Test

3.3 Error rate is defined as "character" not "bit" for the purpose of this forum. (Shift error rate of ratio 1/8 (i.e. 1 shift error causes up to eight text errors and will be counted as such) to be determined)

3.4 Develop User Requirements Document. The outcome of Working Group #2. Represents the effort to provide for future advancements in technology by looking at solutions beyond 45.45 baud, Baudot.

3.5 Define process to update Notification Document: refer updated information to CTIA to be distributed to T-CAT.

AGREEMENTS REACHED AT TTY FORUM - 2

2.1 Combine Working Group #1 and Working Group #3. Develop new set of deliverables based on the October 1, 1998 deadline.

Short term solution: solve for backward compatibility.

Develop Standard Test to measure error rate of TTY over digital.

AGREEMENTS REACHED AT TTY FORUM - 1

1.1 "Solve for 45.45 Baudot, not to preclude looking for other solutions."

Look for long term and near term solutions.

Near term - send through vocoder

Long term - circumvent vocoder, enhance quality and connectivity

Provide for the analog function of wireless phones.

The only body that can change the agreements reached is this body. All agreements remain intact until/unless action is taken in this forum.

APPENDIX B

Recommended Text Consumer Notification

ATTENTION TTY USERS

Background

A TTY (also known as a TDD or Text Telephone) is a telecommunications device that allows people who are deaf, hard of hearing, or have speech or language disabilities to communicate by telephone. A TTY has a keyboard used to type a conversation, which then is transmitted as tones over a wired telephone line. The tones are translated to text that appears on a person's TTY screen.

911 and TTY Access Through Wireless Services

Federal law requires the telecommunications industry to provide a way for TTYs to communicate through wireless systems to make 911 calls. There are two types of wireless phones – analog and digital.

Analog – It is possible today to use some analog wireless phones reliably to call 911 with a TTY.

Digital – It is not possible today to use a digital wireless phone reliably to call 911 with a TTY.

Research is being done to improve the ability of digital phones to work reliably with TTYs. The industry is working to resolve this matter by October 1998.

[Optional: For more information, contact . . .]

DATE OF PUBLICATION:

APPENDIX C

TTY Forum Issue Statements

- 6.1 The TTY Forum doesn't support one solution over the other but it seems that the 2.5 mm jack is preferred
- 6.2 It is acceptable in concept to retrofit the TTY at no cost to the user. Concern was expressed regarding warranty work, and who would perform work on equipment. The retrofit should not eliminate or impact any functionality previously available to the user. Time to retrofit should be reasonable. A liaison should be established between manufacturers and user groups to ensure "certain conditions" are met.
- 6.3 The issue of the false propagation of errors, created by the incorrect receipt of a shift character should be addressed through use of an appropriate test script. The script should contain multiple shifts space apart so that a realistic distribution of character errors would result, based on frequent (although not universal) practice of correcting shift errors by user action. A normal distribution between 1 and ? with a median of about 8 would be appropriate.
- 9.1 The issue of whether less than full rate transmission is an acceptable solution, if it can be shown to provide improved CER performance.
- 9.2 The User Requirements Document will be modified by the consumers before the December TR45 meeting.

APPENDIX D

TTY FORUM MANUFACTURER TESTING COMPLETION MATRIX

Manufacturer	Technology	Through Put Test (Contribution)	Type of Test (Field, Lab)	Contact Name & Number
Philips	Analog	98.07.21.07		Ken Wells
Motorola	Analog	98.05.20.20	Lab	Paul Mollar
Sendelev	Analog	98.07.21.05	Lab	Steve Sendele
Motorola	CDMA	98.05.20.20	Lab	Paul Mollar
Lucent	CDMA	98.05.20.10	Lab	Ahmed Tauf
Lucent	CDMA	No Gain Solution 99.01.26.09	Lab	Dr. Steven Benno
Lucent	CDMA	99.09..09.16	Fixed Point Proof / Concept	Dr. Steven Benno
Nokia	CDMA	98.05.20.17	Lab	Mohamed El-Rayes
Qualcomm	CDMA	98.05.20.12	Lab	Nikolai Leung
Motorola	CDMA	99.05.18.15	Lab	
Ericsson	GSM	98.02.11.07	Lab	Christopher Kingdon
Nokia	GSM	98.05.20.17	Lab	Mohamed El-Rayes
Motorola	GSM	98.05.20.20	Static	Paul Mollar
Ericsson	GSM	98.11.04.14	Static	Steve Coston
Ericsson	All Digial	99.09.09.12 / .13	Static	Steve Coston
Nokia	GSM/TDM A	99.09.09.15	Theory	Doug Neily
Ericsson	TDMA	98.02.11.05	Lab	Christopher Kingdom
Ericsson	TDMA	99.01.26.10	Field	Steve Coston
Motorola	TDMA	98.05.20.20	Field	Paul Mollar
Nokia	TDMA	98.05.20.17	Lab	Mohammed El-Rayes
Philips/CPT	TDMA	98.07.21.07	Field	Jim De Loach 510-445-5510
Lober & Walsh	TDMA	98.09.08.10	Lab	Josh Lober
CPT	TDMA	98.07.21.08	Lab	Josh Lober
Ericsson	TDMA	98.11.04.14	Static	Steve Coston
AWS	TDMA	99.05.18.11	Static	Adrian Smith
NOKIA	TDMA	99.05.18.14	Lab	Massoud Fatini

Lucent	TDMA/CD MA	99.05.18.13	Lab	Steve Benno
Ameriphone	TDMA/CD MA	99.05.18.12	Static	Peter Lee
Lober & Walsh	IDEN	98.09.08.11	Lab	Josh Lober

APPENDIX E

TTY USER REQUIREMENTS

September 10, 1998

To: TTY Forum

Fr: Consumer Representatives

The CTIA has said that most of the consumer criteria previously submitted were not usable by the TTY Forum because the criteria covered marketing and distribution as well as design. Marketing and distribution issues for a possible “one-phone-model-per-technology” short-term plan will be taken up with CTIA’s senior management, as suggested by them.

This contribution is a new set of criteria to address only functional characteristics of the solutions. The new criteria also reflect new information from the Forum since the first list was drawn up. It is intended to cover any solution.

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.
2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.
3. There must be a visual indication when the call has been disconnected.
4. A volume control should be provided.
5. The TTY user must have a means of tactile (vibrating) ring signal indication.
6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)
7. The *landline* party’s TTY must not require retrofitting in order to achieve the desired error rate.
8. The *wireless* party’s TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

9. VCO and HCO should be supported where possible.
10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.
11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.
12. The solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).
13. Drive conditions must be supported, again using AMPS as a benchmark.

September 14, 1999

To: TIA TR-45.3

Fr: Consumer Representatives, Wireless TTY Forum
Authors: Judy Harkins, Gallaudet University and Dick Brandt, dB Consulting as consultant to Gallaudet
David Baquis, Self Help for Hard of Hearing People, Inc.
Alfred Sonnenstrahl, Consumer Action Network
Claude Stout, Telecommunications for the Deaf, Inc.
Karen Peltz Strauss, National Association of the Deaf
Norman Williams, Gallaudet University

Re: Guidance to TR-45 on Proposals for Solutions to TTY over TDMA

Presentations on three of the proposals being considered by TR-45 for the TDMA TTY solution were made at the September 9, 1999 meeting of the Wireless TTY Forum. Given the timeframe TR-45 is operating under, and given that the FCC has directed industry to consider consumer issues in determining solutions, we offer this document as guidance to TR-45 as it considers the alternatives.

The information presented at the September 9 meeting was, in some cases, sufficiently sketchy that consumers were unable to ascertain the functional implications of the proposals. Some presentations were also done very late in the process, so there is not sufficient time for analysis.

We do not state a preference for any proposal but hope the following discussion will be helpful.

General Questions and Issues:

1. There is a concern among consumers about the implications of roaming among digital technologies in the future, if a variety of approaches for TTY access are used. Thus we believe consistency in approach across technologies is needed. One of the carriers also strongly expressed this view. This problem needs to be solved for the long term, not just for the current situation where roaming tends to go to the more-accessible analog network. Once these solutions are implemented, if problems arise, consumers will have great difficulty having them addressed because the solutions are within the network and customer service personnel will not be equipped to deal with them.
2. Has there been any analysis indicating that approaches which propose network changes in switches versus changes in base stations, would lead to earlier availability as claimed? Consumers are interested in seeing solid, lasting and effective solutions, and the speed of implementation, while important, should not override usability considerations.
3. All test results presented to date have been obtained using blocks of data sent out from a file stored either in a TTY or in a computer and sent via a TTY modem. It has been noted in tests

run by Gallaudet that results obtained in an interactive mode (two people typing to each other) yielded poorer accuracy. Thus proposals that show errors in transmission should be scrutinized carefully. A full range of system impairments has either not been used in simulation testing or not reported on all of the solutions.

4. Non-activated phone support for 9-1-1 calls is required by the FCC. Has this been considered in the proposals? (See class mark discussion below.)

Appraisal of Specific Solutions:

Vocoder solution. From a consumer perspective, the Lucent “no gain” solution has been most thoroughly presented and appears to have the most transparent accessibility and the most support for consumer needs and requirements. The inclusion of error correction is a major benefit, given that the air interface presents new challenges to TTY transmission. Other, comparable proposals may also have merit (e.g., Nokia), but they have not been thoroughly explained so that consumers can compare them.

Code conversion. The Ericsson (and Nokia?) Code conversion (“tone”) proposals appear to offer the possibility of earlier implementation (see 2 above) and the ability to use many existing handsets, but have the potential of putting the retrofit burden on the consumer. They raise the following concerns:

1. Smart Cable: Consumers are not opposed to the idea of including intelligence in the cable per se, however the following concerns exist:
 - 1.1. How would this intelligence be powered? (This question could not be answered at the Sept. 9 meeting.) There is opposition to the requirement for an additional battery for reasons of cost, bulk, and reliability.
 - 1.2. Who would make and provide the cable?
 - 1.3. Would this intelligence be built into the regular cable product line or would this be a primarily or exclusively “deaf” product? If the latter, experience shows that provisioning and cost may be serious problems. Customers often have to wait many weeks for “special” accessories. We realize standards bodies do not ordinarily address cost issues, but please consider the additional cost of a phone that vibrates (over a low-end phone), the cost of the TTY, and now the potentially high cost of a special-purpose cable with a small market.
 - 1.4. Would one cable fit all (thereby lowering the price and expanding the availability)?
2. Class Mark: Any system that relies on the phone having a class mark denoting that the user uses a TTY is not likely to be successful, because many deaf and hard of hearing people consider self-identification as a possible threat to their security. 9-1-1 operators have never been successful in having deaf and hard of hearing subscribers “sign up” as a TTY telephone number. The procedure is fraught with potential problems and snafus. When someone roamed into a carrier using this solution (not marked), what would happen? Hearing people who use TTYs may not realize they need to enroll their phones. People who have a phone and acquire a TTY later (e.g., after onset of hearing loss) would find the TTY does not work. TTY users could not use someone else’s cell phone. One solution to this problem suggested

at the forum was to mark all phones as TTY. Would carriers agree to this? In short, a system that provides automatic detection of the TTY signal is preferable.

IWF. Although we recognize that IWF proposals are not a part of the present TR-45 TDMA TTY discussions we would also like to provide the following for your information, as they should be considered in development of proposals:

1. There is a strong desire for VCO/HCO capability, which appears to be difficult to implement in IWF solutions at the present time.
2. There is also a strong desire for provision of the line signal power indicator (flickering light) used to interpret call status.
3. Consumers are opposed to (and the DOJ has mandated against) requiring any form of special dialing (e.g., two-stage) or conditioning sequences (e.g., #NN) to reach 9-1-1.
4. It will be important that the delay between powering on a data device and dialing out not exceed the delay experienced with a voice call.

Appendix: Consumer requirements with comments regarding proposed solutions:

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

Comment: All proposals presented to date appear to meet this criterion. Consumers are concerned that there be sufficient testing to validate this in the field.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

Comment: All proposals claim to meet this criterion and we have no concerns. (IWF solutions may, however, not be able to meet this one.)

3. There must be a visual indication when the call has been disconnected.

Comment: This specific issue has not been addressed in presentations but is covered by most if not all systems by a message on the display of the phone.

4. A volume control should be provided.

Comment: This item is intended to allow the TTY user to adjust volume for better reception of TTY tones as necessary. Most if not all handsets include this feature anyway. It has not therefore been addressed in presentations on solutions.

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

Comment: Again, this is an issue of general provisioning and not related to voice-channel solutions. (However, this will be an issue in IWF solutions.)

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit Baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

Comment: All voice-channel solutions to date appear to support this.

7. The *landline* party's TTY must not require retrofitting in order to achieve the desired error rate.

Comment: All solutions to date appear not to require retrofitting of the landline TTY.

8. The wireless party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

Comment: Solutions that do not require retrofitting or special treatment are preferred by consumer representatives.

9. VCO and HCO should be supported where possible.

Comment: Voice-channel solutions presented to date appear to support this requirement. (IWF solutions may not, however.)

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.

Comment: No solution presented to date reduces throughput, as nearly as we can tell. This should be verified with the companies proposing solutions.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

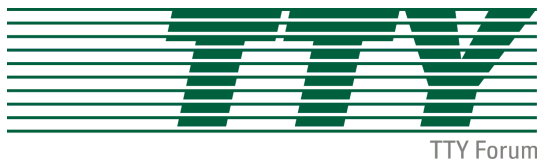
Comment: Voice channel solutions should not cause a problem with this.

12. On the landline side, the solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

Comment: This is of concern because of limited testing of solutions to date.

13. Drive conditions must be supported, again using AMPS as a benchmark.

Comment: This requirement has not been adequately addressed by testing.



Appendix E TTY/TDD Forum – 18

June 12, 2001
ATIS Conference Center
1200 G Street, NW, Suite 500
Washington, DC

TTY User Intervention (*i.e.*, mode switch)

Questions:

1. How often does this have to be done?
2. How many steps are there?
3. How complicated are the steps?
4. Is it easily discovered without using the user's manual?
5. Is it clearly documented?
6. Is there a visual status indication?
 - During set-up?
 - Ongoing?
7. Does the TTY mode setting interfere with the operation of other features of the handset or system? (e.g., does connecting the cable or enabling the TTY mode disable the vibrate feature or the direct dialing capability?)
8. Will it be possible to make a voice call while in TTY mode?
9. Will VCO be a choice or will it be supported as a TTY mode? (Will VCO be incorporated into this mode or is there a series of choices in TTY mode?)
10. How long does it take? How fast can you set it up?
11. Is it possible to change modes during a call?
12. Is it standardized across handsets?
13. Is the process of hooking up the equipment and putting it into TTY mode too long or arduous to be able to answer a call in time?¹
14. When receiving an incoming call, does the phone vibrate? Does the vibrator continue to work when an audio cable is inserted into the jack?

¹ Can a user set up the equipment and get into TTY mode before the call is disconnected or goes to voicemail? Can the phone be answered prior to being connected to equipment?

Notes on Evaluating Solutions against the User Requirements List

Judy Harkins and Norman Williams, Gallaudet University, May, 2001

Some of the carriers have indicated a need to include in their tests and evaluations all of the user requirements generated in 1998 in the TTY Forum. This document annotates the requirements with notes about evaluation issues and field test procedures from a user perspective. This is obviously not a test plan but is sent out primarily for generating discussion and giving general guidance from the user viewpoint.

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

See appendix.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

Suggestion: Generate all audio call progress signals (ringing, busy, fast busy, voice answer) and determine if there is an understandable visual indication for each. The line status light on the TTY will probably function appropriately in voice channel solutions, but this should be verified. Check that the visual indication is synchronized in time with the audio indication.

Comment: A particular issue in wireless telecommunications is that call to mobile phones often do not ring at all if the party is unavailable; a voice message is provided instead. There may not be a visual indication of the call status on the telephone. Another issue is that many phones revert to voice mail. In these situations, the TTY caller will not be able to monitor all aspects of call progress provided to voice users.

3. There must be a visual indication when the call has been disconnected.

Suggestion: Place call and have other side hang up. What visual indication is given? If the user can tell, by looking at the handset for example, that the call is terminated, then this criterion is met.

Comment: It would help all users to have an explicit message, but if this is not provided, the user should know what the screen will look like upon call termination.

4. A volume control should be provided.

Comment: Determine and document the optimum volume control setting for the TTY being tested. (If performance is affected by volume control, users will need to be informed of this, and how to use the volume control to obtain a low error rate.)

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

Suggestion: Verify that the handset or accessory vibrates on receipt of calls (and preferably not at other times!). Can the tester receive calls in a timely fashion with the ringer turned off? (Test throughout the call; some external vibrators continue to vibrate throughout a call, which can be confusing.)

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit Baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

Suggestion: On outgoing call, press keys on the TTY during ring signals and immediately after answer. Baudot tones should be clearly audible by the answering party. (This should not be a problem for voice channel solutions, but is worth some quick tests in the field.)

7. The *landline* party's TTY must not require retrofitting in order to achieve the desired error rate.

Comment: This issue appears to be moot and does not need to be tested.

8. The *wireless* party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

Comment: This is not an issue for testing. However, if an accommodation is required, such as retrofitting, a special model, or a cable, this should be well documented so that consumers know what types of equipment they will need. If PDAs or paging devices are used in place of a handset and TTY combination, attention will need to be paid to the rate of input that can be achieved through the keyboard or virtual keyboard.

9. VCO and HCO should be supported.

Suggestion: Evaluating the efficacy of VCO and HCO:

- VCO and HCO should be tested as they will be implemented. For example, if a custom cable is needed, tests should be run with that cable as part of the set-up. If the user needs to take action between turns (e.g., pushing a button), it should be tested with consumers to check usability.
- Does the system deliver acceptable error rates with devices on the market that are designed to work in VCO and in a mobile environment? (Ameriphone Q90, Krown Pocket VCO, and the Ericsson handset adapter are the three known examples.)
- Is the quality of voice on VCO calls the same as on non-TTY calls? This can presumably be tested using standard industry methods for voice quality.

- Is there any delay or cut-off of characters or words when switching between voice and TTY?
- Is there greater chance of disconnect when switching between voice and TTY? Other problems?

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.

This issue is now moot, and no tests are needed.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

This would not appear to be a problem on voice channel solutions. On data channel solutions, the call would need to carry the same identifying information as would be carried were it in the voice channel.

12. On the landline side, the solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

A variety of TTY models should be tested, but the amount of testing on each model will necessarily vary. The difficulty in testing with a large number of models is acknowledged, given the limitations in data capture possibilities with TTYs and some 911 TTY systems on the market. This may have to be handled by short tests – calling to direct-connect landline TTYs set to auto answer, where the tester can call send a string of identifying information about the call, which can then be sent back to the tester for scoring. This might be able to be arranged at Gallaudet if there is interest; more discussion is welcome. (Note that Gallaudet has produced some software tools and documentation for partially automated two-way TTY testing: www.tap.gallaudet.edu/ttytools)

13. Drive conditions must be supported, again using AMPS as a benchmark.

Tests for drive conditions should be run using carriers' individual methodologies and facilities. The consumer's goal is to be able to use the TTY and telephone while a passenger in a car, while on a train, etc.

Appendix User Requirement 1: Error rate of TTY over Wireless telephones

- Interoperability among handsets and infrastructure vendors should be tested using industry's usual tests.
- Varying signal conditions need to be tested.
- Varying network conditions need to be tested.
- Data should be collected and scored on both sides (directions) of the call wherever possible.
- See Requirement 12 on accommodating a range of TTY models. Compatibility testing with 9-1-1 TTY equipment should be coordinated via Toni Dunne.
- See Requirement 13 on drive tests.
- Calls through relay should be placed. A hearing person on the landline side should read one side of the script. (This is an example of where random characters will not be helpful). Relay operators cannot retain conversations; unless special arrangements can be made with TRS providers for test calls, the only way to ascertain is to ask the relay operator if the incoming text was garbled.
- We tentatively recommend that Lober and Walsh's SCORE program be used as this was developed through the TTY Forum. There is some indication based on limited tests that the Ericsson program results in a higher error rate.
- Scripts: A few comments -- Consumers have had the concern that the error rates generated by the TTY Forum's random character set may be inflated due to the excessive number of register shifts (sending a shift character between each figure/letter transition) in this script. It is not possible to eyeball the results in the field because of the random characters. The random character file also transmits only at full rate – there are no pauses.

Matt Kaltenbach of Ericsson has suggested that it would be helpful to base at least one script on the bit structure of Baudot or some other mathematical basis that would allow for diagnosis of problems in the field.

Gallaudet has produced a series of scripts that use conversational language and natural shifts between letters and figures, pauses in typing and simulation of two typing speeds. These are available at <http://tap.gallaudet.edu/ttytools>

Comment on the 1% benchmark: It was our intention, when we wrote this requirement, that 1% would apply to reasonable signal conditions and network conditions, and *not* that a maximum of 1% error rate must be met on every single call in the presence of severe (and rarely occurring) impairments.

APPENDIX F

WORK PLAN

Published as a separate TTY Form Document

APPENDIX G

Typical Operating Characteristics for Wire-Line Based TTYs

The following is a technical description of the typical operating characteristics for existing wire-line based Text-Telephones for the Deaf (TTYs). This document is not intended to be a performance description of any one product, but to give a representation of performance of the majority of the product supplied to wire-line TTY customers in the last five years. TTY manufacturing representatives has reviewed this information and agrees that it represents an accurate account of the performance characteristics of existing wire-line products.

It should be noted that it is not possible to precisely define performance for all products, in all situations, in the field. Variation beyond this technical representation does exist for older product, products that are no longer supported by a manufacturer, individual products that are not operating correctly and improper use of product. It is not possible to report this additional range of variation, only to say that these products performance would suffer on either a connection to wire-line or wire-less TTY.

TECHNICAL BACKGROUND

For Frequency Shift Keying (FSK) two signal frequencies are required to modulate the asynchronous serial data to be sent over the conventional voice grade telephone lines of the switched telephone network. For Baudot communications to be useful on the Public Switch Telephone Network (PSTN) these frequencies fall within the central portion of the telephone line pass-band (300 – 3300 Hz).

The two frequencies of the transmitted signal must be sent in accordance with FCC requirements defined in dBm (decibels with reference to a power of one milliwatt for metallic connections, where 0 dBm = 1 milliwatt). The acoustic measurements are in dBSPL for acoustic configurations. This signal is measured at the TTY interface, either at the metallic connections or where it is acoustically coupled to the telephone network.

The receive level, commonly referred to as sensitivity, is also given for each pair of frequencies. This signal, also measured in dBm for direct connections and dBSPL for acoustic configurations, is the typical signal measured at the connection that will result in error-free reception of a test message.

BAUDOT CODE OPERATION

All TTYs provide Baudot code operation employing half-duplex, simplex, asynchronous, FSK transmission.

Frequencies

Baudot code operation used the following frequencies:

Signal	Frequency	Tolerance	
		Transmit	Receive
Mark	1400 Hz	$\pm 1\%$	$\pm 4\%$
Space	1800 Hz	$\pm 1\%$	$\pm 4\%$

Bit Duration

The bit duration is 22.00 milliseconds (ms) ± 0.40 ms to provide a nominal baud rate of 45.45 bits per second.

CHARACTER FORMAT

Transmit

The Baudot code for each character is transmitted with the following format, the data bits assigned are in accordance with Table 1.2 with a “1” in the binary representation transmitted as a mark and a “0” as a space.

Bit	Start	Data	Data	Data	Data	Data	Stop
Signal	Space	LSB	Bit 2	Bit 3	Bit 4	MSB	Mark
Number of Bits	1	1	1	1	1	1	1.5-2.0 2.0 Typ.

Table 1.1

Where the LSB is the Least Significant Bit and the MSB is the Most Significant Bit. The bits shall be transmitted from left to right.

Receive

The TTY is capable of receiving characters with the format of Table 1.1 with a stop bit of at least 1.0 bit length or longer. The receiver is capable of receiving characters either with the space tone of the start bit as the first tone received or with a mark tone preceding the start bit.

Mark Hold Time

The mark hold time defines an additional period of time during which the TTY transmits a mark hold tone (1400 Hz) following the last character transmitted. Mark hold tone is not transmitted between each character if the character is followed immediately by another character. The mark hold tone is transmitted for a period between 150ms to 300 ms after the end of the stop bit(s).

Transmit Levels		
Coupling Method	Level	Range
Acoustic Direct Connect	108 dBSPL -10 dBm	± 6 dB * - 3 ,+1 dB

Sensitivity Levels		
Coupling Method	Level	Range
Acoustic Direct Connect	72 dBSPL -40 dBm	± 6 dB * ± 5 dB

Most receivers are capable of receiving signal up to at least -5dBm.

* NOTE: Acoustic performance variations greater than listed may be encountered and are a result of many variables including the type of telephone handset used and how well the acoustic coupling is made by the user. It is not possible to report this additional range of variation, only to say that these products performance would suffer on either a connection to wire-line or wire-less TTY.

TABLE 1.2

Set of Baudot Codes for TTYs

DEC	HEX	BINARY	LETTER	FIGURE
0	00	00000	BackSpace	BackSpace
1	01	00001	E	3
2	02	00010	LF	LF
3	03	00011	A	-
4	04	00100	Space	Space
5	05	00101	S	
6	06	00110	I	8
7	07	00111	U	7
8	08	01000	CR	CR
9	09	01001	D	\$
10	0A	01010	R	4
11	0B	01011	J	'
12	0C	01100	N	,
13	0D	01101	F	!
14	0E	01110	C	:
15	0F	01111	K	(
16	10	10000	T	5
17	11	10001	Z	“
18	12	10010	L)
19	13	10011	W	2
20	14	10100	H	=
21	15	10101	Y	6
22	16	10110	P	0
23	17	10111	Q	1
24	18	11000	O	9
25	19	11001	B	?
26	1A	11010	G	+
27	1B	11011	FIGS	FIGS
28	1C	11100	M	.
29	1D	11101	X	/
30	1E	11110	V	;
31	1F	11111	LTRS	LTRS

Note: CR and LF may be manually or automatically generated by the TTY. If automatic generated, the sequence may contain an extra (non-printable) character to provide adequate time for older electromechanical TTYs to respond. CR & LF are inserted into the transmitted characters after a maximum of 72 characters to allow for the carriage return of older electromechanical TTYs.

APPENDIX H

Modem / IWF Manufacturer Contact List

List of Names and Addresses to Receive IWF Letter

FirstName	LastName	Company	Address	Address2	City	State	Zip
Veda	Krishnan	Cirrus Logic	110 Horizon Dr	#300	Raleigh	NC	27615
Zarko	Draganic	Alto Com Inc.	257 Castro St	Suite 233	Mountain View	CA	94041
Edward	Campbell	3Com					
Raouf	Halim	Rockwell	4311 Jamboree Rd		Newport Beach	CA	92660
Aaron	Fisher	Lucent	Room 55F-311	1247 S. Cedar Crest Blvd.	Allentown	PA	18105
Judy	Sheff	Lucent	Room 5SF18	2 Oak Way	Berkeley Heights	NJ	07922
Greg	Garen	Lucent Technologies - Microelectronics Group	Room 22W-219(Mail Stop EQ)	555 Union Blvd.	Allentown	PA	18103
Warren	Henderson	Henderson Laboratories					
Moiz	Beguwala	Rockwell	4311 Jamboree Rd		Newport Beach	CA	92660

CC: National Association of State Relay Administration (NASRA)
Merilyn Crain, Chair
315 So. College Rd. Suite 208
Lafayette, LA 70503

APPENDIX I

TTY Forum Chair's Update Memorandums

IWF letter dated November 16, 1998

Sent to:

3Com

Mr. Zarko Draganic, CEO, Alto Com Inc.

Ms. Veda Krishnan, (to be supplied) Cirrus Logic

Mr. Aaron Fisher, Vice President, Wireless Products, Lucent Technologies

Ms. Judy Sheff, VP Intellectual Property, Lucent Technologies

Mr. Greg Garen, General Manager Modem and Multimedia Products Lucent Technologies -
Microelectronics Group

(To be supplied), Motorola

Mr. Raouf Halim VP and General Manager, Network Access Division, Rockwell Semiconductor
Systems

Mr. Moiz Beguwala, VP and General Manager, Personal Computing Division, Rockwell
Semiconductor Systems

Dear Sir/Madam

In response to a FCC inquiry, the Cellular Telecommunications Industry Association (CTIA) and the Personal Communications Industry Association (PCIA) have established a technical forum to address the issue of providing reliable communications for deaf and hard of hearing people over digital wireless systems. Specifically this forum is addressing the issue of deaf and hard of hearing people using digital wireless connections to access 9-1-1 centers.

A solution that appears to offer promise for the longer term, involves the use of new (or modified) communications terminals, used by deaf and hard of hearing people, (TTYs) connected through a serial interface to the digital cell phone. The data channel, provided by the air interface, would then be used to effectively extend this interface to the network. This of course, would require the use of an Interworking Function (IWF)^{*2} in the network that would be capable of supporting TTY communications. We are aware that some of the IWFs being developed will support 45.45 Baudot TTY transmission (the transmission mode most commonly used by deaf and hard of hearing people in the United States). While this caters well to the present need, it has the drawback that it locks deaf and hard of hearing people into this older technology.

A more desirable solution would be one which would involve the use of ITU-T Recommendation, V.18, that specifies a protocol, which provides for higher speed ASCII based communications while at the same time maintaining compatibility with today's Baudot TTY devices. The problem with this solution is that V.18 has yet to be implemented by any major modem manufacturer. We have, however, been given a presentation by a UK based company that has developed a prototype "stand alone" V.18 product which it plans to introduce commercially early next year. In addition to this, we have been given a demonstration of an in-service Swedish IWF, which incorporates V.18 functionality. It might also be of interest to note

² The term IWF is used in its broadest sense in this letter. (See the definition in TIA TSB-100)

that the service provider sees text telephony as a generic service (e.g. not just for deaf or hard of hearing). These two events may be moving V.18 into the readily achievable category.

It seems likely that if the IWF function and the modems installed at the 9-1-1 centers were to incorporate V.18 capability, connections could be made at the higher V.18 rates. Likewise it would appear that the connect time could be shortened as V.18 incorporates a calling tone, which could be instantly recognized by equipment at the 9-1-1 centers, thereby eliminating the loss of precious time, which is normally incurred while attempting to determine the source of a "silent" call.

Assuming that you agree that the timely provision of this functionality is important, we are hoping that you can provide us with an indication of when we might expect to see products (e.g. consumer modems, IWFs) from your company that implement V.18. Any information you could provide to us, by 4th Quarter 1998, would greatly help us in developing our response to the FCC.

Date: March 22, 1999

FM: TTY Forum Co-Chairs; Ed Hall, CTIA and Todd Lantor, PCIA
TO: TTY Forum Members and Interested Parties

RE: TTY Forum Update

Greetings,

A recent conversation with Dr. Steven Benno of Lucent Technologies has informed us that he has completed the Lucent software simulation of the TTY "no-gain" solution and it is now released and available to all those interested in exploring its functionality, compatibility and potential benefits with various CLEP vocoders. According to Dr. Benno, the following equipment and infrastructure vendors have requested a copy of his newly released code for testing purposes; Ericsson, Motorola, Nokia, NORTEL and Qualcomm. As co-chairs, we remain hopeful that this Lucent contribution will spark an interest for some manufacturers to re-visit their past efforts with vocoders, which perhaps may lead to follow-on contributions at our next TTY Forum.

During the last TR45 meeting, (March 3-4) CTIA submitted the 2.5mm Jack SRD, on behalf of the Forum. TR45 accepted this contribution and remanded it to the TDMA (TR45.3) and CDMA (TR45.5) sub-committees for information and to the appropriate sub-committee (TR45.1) for Action. Likewise, the TDMA and CDMA sub-committees reported back to the Chair that both of these digital technologies have developed standards supporting the Inter-working Function (IWF) as described in the TTY Forum's SRD on Circuit Switched Data submitted during the December TR45 meeting. This news brings the industry one step closer to the Forum's proposed "long term" data solution. The willingness of some modem manufacturers (3COM) to support the V.18 protocol is the other critical issue needed to make the IWF a viable option to carriers as a means of supporting TTY over digital - long term. The IWF solution opens the doors to the future by allowing end-users the use of ultra-light computers, compact PDA's, etc.

At this point I think it is important to remember that it has been the synergy, team-spirit and positive environment provided by the members of the TTY Forum that has lead us to this point. But, we do not want anyone to have the false impression that the end-all, be-all solution(s) have thus far been developed. Although Dr. Benno's "no-gain" solution remains a major breakthrough for TTY, "short term", voice based (specifically CLEP vocoders) solution and the V.18 protocol a major breakthrough for TTY "long term", data solution these by no means require carriers or manufactures to implement anyone one or both of these solutions. Keep in mind the other solutions brought to the Forum by Lober and Walsh and Ericsson. These solutions have also proved to be quite successful and promising for certain digital technologies. It is important to keep in mind that the carrier is responsible for the selection and implementation of a solution(s) that will allow TTY users to access 9-1-1 over its digital system. The best we as a Forum can do at this point is continue to provide the positive environment, feedback and input to manufacturers and carriers regarding testing and consumer needs and requirements and keep the standards development bodies involved when needed. CTIA and PCIA remain committed.

In conclusion, we propose that at the next TTY Forum we initiate the process to develop the final report to the FCC. Based on the contributions received to date and those anticipated at our next meeting, we believe we will have sufficient information to develop specific comments and recommendations. The TTY Forum can then plan to meet on a quarterly basis to "evaluate" progress and provide the FCC with a periodic, implementation status report.

My thanks to all members of the TTY Forum. Looking forward to seeing everyone in May.

July 23, 1999

Fm: TTY Forum Co-Chairs
TO: TTY Forum

RE: Update: TTY Forum and Interested Parties

Todd Lantor and I would like to take this opportunity to provide you with an overview of some interesting developments that have come to our attention since the last Forum held on May 18th, 1999.

The Lucent "no gain" vocoder solution has been widely accepted by TR45.5, the CDMA air-interface standards group. The "no gain" solution draft standards document has recently been prepared for ballot. Assuming a "clear" ballot response, the industry may have a CDMA TTY standard as early 4Q99. Likewise, TR45.3, the TDMA air-interface standards group is actively pursuing the same course as the CDMA group. The Nokia variation, presented to the Forum during the May meeting is being reviewed and considered. The group plans to complete its deliberation quickly and move toward the final stages by preparing a draft document for ballot.

Ericsson has provided the co-chairs with a copy of a document that proposes an alternative approach to the Lucent "no gain" vocoder solution. In the interest of time, and to take advantage of the TR45.3 meeting cycle, Ericsson thought it prudent to submit the alternative approach directly to the TDMA working group. Although it is being discussed at standards, Ericsson will present this vocoder alternative at the upcoming September TTY Forum.

Concurrently, we are preparing a draft "TTY Forum Status Report" for the FCC. The report, as a minimum, will contain the following sections:

- Updated Work Plan
- TTY testing completed to date
- A Technical Standards Update
 - Voice Based Approach
 - Data Approach
- Comments and Recommendations

Todd and I plan on getting a draft of this report to the TTY Forum Steering Committee for their review and approval before the next TTY Forum: The Steering Committee is comprised of: Toni Dunne, Texas 9-1-1; Billy Ragsdale, Bell South; Claude Stout, TDI; Norm Williams, Gallaudet UN; Jeff Crollick, TIA; John Melcher, NENA.

Next Meeting: We are currently making arrangements for the **September 9, 1999** TTY Forum and will get the meeting logistics out separately.

The meeting will be in the **Washington DC** area but **WILL NOT** be at Gallaudet Univ. Their calendar cannot support us. The meeting will start at **9:00 AM** and adjourn at 5:00 PM. Please do not make travel arrangements leaving the DC area before 6:30 PM. Now that we have reduced the meetings to one day, I see this Forum's agenda as being quite full.

Thank you all and have a very cool and pleasant summer. See you September!

Appendix J

Technical Standards Reference

<u>ID</u>	<u>Description</u>
TIA/EIA 825	FSK Modem
TIA/EIA TSB-121	Cellular Subscriber Unit Interface for TDD
TIA/EIA-IS-823-A (PN-4614)	TR 45.3 5.3 TDMA TTY Solution- 410 vocoder
TIA/EIA-IS-840-A (PN-4721)	TR 45.3 5.3 TDMA TTY Min Performance.
TIA/EIA/IS-789-A:	Electrical Specification for the Portable Phone to Vehicle
IS-733-2, IS-127-3	- CDMA Vocoder Standards - high rate
IS-707-A-2	CDMA Data (V.18) Standard
3GPP2 C.S0028	CDMA TTY/TDD Minimum Performance Specification
TIA/EIA-136-270-B	TDMA Third Generation Wireless – Mobile Stations Minimum Performance
TIA/EIA-136-280-B	TDMA Third Generation Wireless – Base Stations Minimum Performance
3GPP TS26.226	Cellular Text Telephone Modem Description
3GPP TS26.230	Cellular Text Telephone Modem Transmitter Code
3GPP TR26.231	Cellular Text Telephone Modem Minimum Performance Specifications
ETSI ETR 333	Text Telephony, User Requirements and Recommendations
ITU-T Rec. v.61	Analog simultaneous voice and data (permits VCO with ASCII modems)
ITU-T Rec. V.18	Operational and Interworking Requirements for DCE's operating in the Text Telephone Mode
ITU-T Rec. V. 250	Serial asynchronous automatic dialing and control

ITU-T Rec. V.8	Procedures for starting sessions of data transmission over the public switched telephone network
T1.718	PCS 1900 Cellular Text Telephone Modem (CTM) Transmitter Bit Exact C-Code
T1.719	PCS 1900 CTM General Descriptions
T1.720	PCS 1900 CTM Minimum Performance Requirements
TIA/EIA-688	DTE/DCE Interface for Digital Cellular Equipment

Timeline of Events in CDMA and TDMA standards

CDMA: TIA TR45.5.1.1

=====

August 2000: Lucent proposed bug fixes to the TTY/TDD addenda and proposed a TTY/TDD Minimum Performance Specification for CDMA.

November 2000: Nortel proposes to add a test vector to the Min Perf Spec in order to handle the hard handoff scenario. This scenario uncovers another bug in the code.

Dec 2000: Lucent proposes another bug fix, which is approved, but the subcommittee doesn't baseline the fixes in order to give more time to find problems.

Jan 2001: Updates to the TTY specifications and Min Perf Specs are baselined and sent to V&V.

TDMA: TIA TR45.3.5

=====

October 2000: Proposed bug fixes to IS-823 TTY Extension to TIA/EIA 136-410.

December 2000: Proposed additional bug fix similar to the bug fix proposed for CDMA in Dec. 2000.

January 2001: Nokia and Ericsson present contribution questioning the necessity of any bug fixes. Nokia proposes change to standard to improve TTY performance during signaling.

February 2001: A problem is found with IS-840 TTY/TDD Min Perf Spec for TDMA. Nokia (the editor) will provide an update to fix problem and update based on Nokia's proposed change to IS-823.

March 2001: Changes to IS-823 are approved. Nokia commits to having a new version of IS-840 for review by next meeting. The subcommittee decides to ballot new versions of IS-823 and IS-840 together.

APPENDIX K

Glossary of Terms

Telecommunications Standards and Assignment Organizations

ANSI - American National Standards Institute

The ultimate accolade for any standard is ANSI certification. This does not mean that ANSI has reviewed the standard, but that it has been circulated widely throughout the industry and that it conforms to their document design and publication guidelines. TIA standards, for example, start their public life as an IS- (Interim Standard) and then proceed within a few years to a full ANSI standard. The analog cellular standard started as EIA/TIA IS-3 and is now the ANSI standard identified as EIA/TIA-553.

ATIS - Alliance for Telecommunications Industry Solutions

The major US telecom standards organization beside the TIA, most responsible for ANSI SS7 standards. This organization was previously called ECSA; Exchange Carriers Standards Association. SS7 and wireless standards are developed within the T1 committee.

Bellcore - Bell Communications Research

Bellcore is not a standards organization, but they do write technical documents that are treated as if they were standards by many telecommunications carriers, particularly their former owners, the 7 regional bell operating companies. These documents include the GR-145 specification for interconnect, enhanced SS7 specifications beyond ANSI and the WACS low-mobility PCS system. Bellcore also performs many other research and consulting functions.

ETSI - European Telecommunications Standards Institute

The mission of ETSI is "to produce the technical standards which necessary to achieve a large unified European telecommunications market". This includes the specification of the GSM cellular and PCS standard.

IFAST - International Forum on ANSI-41 Standards Technology

A forum on international cellular carriers, vendors and service providers that attempts to resolve international roaming problems with AMPS-compatible systems (i.e. including IS-136 D-AMPS and IS-95 CDMA). The organization has taken responsibility for allocating the International Roaming MIN resources (MIN's starting with the digits 0 or 1) and new blocks of SID codes.

INC - Industry Numbering Committee

The Industry Numbering Committee (INC) is a standing committee of the Carrier Liaison Committee (CLC). The INC provides an open forum to address and resolve industry-wide issues associated with the planning, administration, allocation, assignment and use of resources and related dialing considerations for public telecommunications within the North American Numbering Plan (NANP) area.

ITU - International Telecommunications Union

The ITU is the global equivalent of ANSI for telecommunications standards. In fact, the world is divided into the majority of countries that adhere to ITU standards, and the US and Canada that tend to use ANSI standards. AMPS cellular is an exception, as it

has been implemented in many other countries. ITU standards that are used in AMPS cellular include: E.164 - the global numbering plan. E.212 - the global mobile identification plan. Q.7xx - a series of standards defining Signaling System #7 (used as an alternative to ANSI SS7 in AMPS countries outside the US and Canada).

NANPA - North American Numbering Plan Administration

The organization responsible for allocating numbering resources within the North American Numbering Plan Area: USA, some of its territories, Canada and several Caribbean nations. Controlled by Bellcore until January 1998, it is now managed by Lockheed-Martin. It is responsible for assignment of new area codes within the North American Numbering Plan and office code assignments within US states and territories.

NENA - National Emergency Number Association

NENA, along with NASNA (National Association of State 9-1-1 Administrators), APCO (Association of Public Safety Communications Officials) and the TIA are responsible for promoting enhanced 9-1-1 standards for wireless systems.

TIA - Telecommunications Industry Association

WWITF – Wireline Wireless Integration Task Force

Government and Regulatory Organizations

Australian Communications Authority (ACA)

The organization responsible for the management of radio spectrum and telecommunications in Australia, formed by a merger of AUSTEL and SMA. APUMP represents people who are unhappy with the decision to eliminate analog cellular by the year 2000 in favor of the three GSM systems.

RSP - New Zealand Radio Spectrum Authority

Responsible for the management of radio spectrum in New Zealand.

US Dept. of Commerce

The Office of Telecommunications provides a great online source of worldwide wireless telecommunications information.

FCC - US Federal Communications Commission

The organization responsible for the management of telecommunications in the United States. Their responsibilities for public radio communications, such as cellular, include allocation of frequencies, the development of regulations that govern their use and monitoring to ensure that regulations are followed.

Wireless Telecommunications Trade Associations

ATIS – Alliance for Telecommunications Industry Solutions

CTIA - Cellular Telecommunications Industry Association

A trade association of wireless carriers in the United States, Canada and other countries. Originally a cellular organization, it now has members that are Manufacturers, PCS, ESMR and Satellite carriers.

CWTA - Canadian Wireless Telecommunications Association

A trade association of wireless carriers in Canada.

MMTA - Multi-Media Telecommunications Association

An association of companies focused on computer-telephony integration. They announced in November 1996 that they were merging with the TIA.

PCIA - Personal Communications Industry Association

Formerly Telocator, this organization represents Paging, PCS, ESMR, SMR and mobile data service providers as well as communications site managers, equipment manufacturers, and others providing products and services to the wireless industry.

TIA - Telecommunications Industry Association

United States Telephone Association.

A trade association for US local exchange carriers.

Wireless Forums

CDG CDMA Development Group

A trade association dedicated to the promotion of CDMA wireless technology.

MIPS Mobile Internet Phone Services Forum

A new group dedicated to promoting the development of Internet access technologies, services and features from mobile devices.

PACS Providers Forum

PACS (Personal Access Communication System) is a PCS system based on Bellcore's WACS and Japan's PHS, that will provide 64kbps voice and data, but is restricted to low mobility applications.

Universal Wireless Communications Consortium

Promoters of the IS-136 TDMA digital cellular and PCS standards, mostly through conferences and symposiums.

WDF The Wireless Data Forum is an independent, protocol-neutral trade group dedicated to promoting the wireless data industry. WDF's members include wireless operators and equipment providers, application developers and information technology companies working to advance wireless and mobile data products and services.

Glossary

Analog Signal A signal that varies in a continuous manner, such as voice.

ANI Automatic identification of the calling station

ANSI American National Standards Institute.

ATIS Alliance for Telecommunications Industry Solution (formerly ECSA). Responsible for ANSI SS7 standards and US GSM standardization.

BS Base Station

CPAS Cellular Priority Access Service

ESN Electronic Serial Number

GETS Government Emergency Telephone Service

HLR Home Location Register (database of subscriber records)

IFAST International Forum for AMPS Standards Technology

INC Industry Numbering Committee

IS TIA Interim Standard.

JEM Joint Experts Meeting

J-STD Joint ATIS and TIA standard.

LERG Local Exchange Routing Guide

LEA Law Enforcement Agency
MS Mobile Station (i.e. wireless phone)
MSC Mobile Switching Center (aka MTSO)
NAG Numbering Advisory Group
PACA Priority Access Channel Assignment
PN TIA Project Number. Identifies a project during development of a standard.
SP ANSI Standards Proposal. ANSI equivalent of a PN
TLDN Temporary Local Directory Number
TIA Telecommunications Industry Association
TTY Text Telephony
TDD Telecommunications Device for the Deaf
VLR Visited Location Register
WIN Wireless Intelligent Network

APPENDIX L

IMPLEMENTATION STATUS REPORTS	53
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AT&T Wireless Services, Inc. (“AWS”) supports the vast majority of its approximately 20 million customers on a nationwide network using the TDMA (ANSI-136) air interface. As specified below, AWS completed deployment of the infrastructure and software necessary for digital-TTY compatibility on the TDMA network prior to the June 30, 2002 deadline, and that feature is now available to consumers.

In addition, AWS is in the process of building a nationwide GSM network. That portion of the operational GSM network served by Ericsson also was TTY-compatible as of June 30, 2002. During field testing of necessary software, AWS and its second GSM vendor, Nokia, discovered critical errors that required AWS to seek a temporary waiver of the deadline for its Nokia GSM markets. On June 28, 2002, the FCC granted AWS’s request for a limited waiver of the implementation deadline until September 30, 2002. As described below, AWS has worked aggressively with Nokia to resolve the software problems and remains confident that it will be able to fully deploy TTY-compatibility in its remaining operational GSM markets by the September 30 date approved by the Commission.

Deployment of TTY Capability in the TDMA Network

AT&T Wireless completed deployment of TTY compatible software on all three of its TDMA platforms in accordance with the June 30, 2002 deadline. AWS continues to participate in PSAP testing being overseen by ATIS.

Deployment of TTY Capability in the GSM Network

Ericsson GSM Status:

As noted above, timely compliance was achieved in commercially launched Ericsson GSM markets in accordance with the June 30, 2002 deadline.

Nokia GSM Status:

AWS and Nokia are on schedule with the milestones addressed on page 8 of AWS’s Petition For Waiver and expect to achieve full compliance on or before September 30, 2002, as approved by the FCC. AWS will keep the Commission fully informed of any changes that could affect the ultimate compliance date.

Handset Testing and Availability

TDMA Handsets:

AT&T Wireless continues to offer the Panasonic TDMA TTY-capable handsets (models EB-TX310 and EB-TX320) in our retail stores. The Nokia 6360 TDMA TTY-capable handset also

was made available in our retail stores during Q2 of 2002. Throughout Q2, 2002, AWS continued to test additional handset models produced by Motorola, Nokia and Sony/Ericsson.

GSM Handsets:

AT&T Wireless now has a Sony/Ericsson TTY-capable GSM handset available. AWS is testing additional models from Nokia and Motorola, which we expect to be made widely available through AWS's retail stores during Q3 2002.

Progress of TTY-Digital Deployment Solutions
CC Docket No. 94-102
Final Quarterly Report
July 10, 2002

#1 Network infrastructure software development:

Caprock Cellular utilizes Nortel Networks equipment to provide TDMA digital services in Texas RSA 4. A report from Nortel Networks states that development of software is complete, and product tests have been completed as well. Testing was limited to Panasonic prototype handset, as other equipment was not available during the test.

#2 Handset development and testing plans

Caprock Cellular must rely on handset vendors to develop the required handsets. When handsets are available testing can be performed with area PSAPs to insure compatibility.

#3 Beta testing and lab testing

Caprock Cellular must rely on Nortel Networks and handset vendors for initial conformance testing.

#4 Release and general availability to carriers of network infrastructure software

The required software load, MTX10 was deployed March 6, 2002. The switch is in compliance.

#5 Availability to carriers to full acceptance test units

Nortel Networks plans to test and confirm the solution performance during the six-month extension allowed for this purpose.

**Caprock Cellular Limited Partnership
Progress of TTY-Digital Deployment Solutions
CC Docket No. 94-102 - Final Quarterly Report**

#6 Efforts toward achieving digital wireless solution capability with enhanced TTY devices.

The solution provided by the MTX10 software load addresses Baudot type messages only. Other capabilities may be included later, after standards are adopted.

#7 Carrier coordination of testing with PSAP

See response to item #2 above.

#8 Carrier testing activities, including field testing, consumer end-to-end testing, and other necessary tests.

Caprock Cellular will acquire compatible handset when available and test service.

#9 Retail availability of necessary consumer equipment

At this time it is unknown when handsets will be available.

#10 Geographic scope of network infrastructure deployment

The required software load for the cellular switch (MTX10) has been installed. See #4

North Carolina RSA 3 Cellular Telephone Company
d/b/a Carolina West Wireless
TTY Report
Second Quarter 2002

Background

Carolina West Wireless uses TDMA technology
Infrastructure vendor is Nortel
Phone manufactures include Nokia, Motorola and Ericcison

Status

There is no change on the infrastructure status from the last report.

Testing began in mid second quarter concerning the existing service provided to and from the PSAPs and using a Nokia 6360. A test script was sent to each PSAP. Testing results mirror the results that have been reported through ATIS in that PSAPs received only 70% to 75% accurate data from the mobile unit. This high error rate is the result of 20 to 25% character error and unintelligible data being received. Test summaries are as follows:

Surry County, NC No complete accurate data was received.
Conclusion: Possible incompatible equipment at PSAP

Wilkes County, NC No complete accurate data was received
Conclusion: Possible incompatible equipment at PSAP
New equipment at PSAP

Avery County, NC No complete accurate data was received, PSAP could not transmit
Data toward cellular equipment
PSAP expects to replace equipment in the near future.
Beech Mountain Police Dept. was unable to receive data. TDD device not functional

Alleghany County Test inconclusive, old TDD equipment
PSAP may replace equipment in the near future.

Boone, NC Police Dept. No complete accurate data was received
Conclusion: Possible incompatible equipment at PSAP
PSAP expects to replace the equipment in the near future.

Watauga County No complete accurate data was received.
Conclusion: Possible incompatible equipment at PSAP.
PSAP expects to replace equipment in the near future.

Ashe County Test postponed at the request of the PSAP. Will be tested during the third Quarter of 2002.

Very little usage was experienced by any of the PSAPs. None of the PSAP equipment was known to be updated to be compatible with wireless TDD technology. PSAPs have been advised to contact their TDD suppliers and ascertain what modifications will be required.

Equipment testing for mobile to mobile using the Nokia 6360 was successful. Preliminary mobile to mobile test calls proved to be 95% accurate. Motorola has made the V60TI available to us. Ericsson has not yet provided a compatible handset for testing. Further testing both mobile to mobile and mobile to PSAP using both the Nokia 6360 and Motorola V60TI is scheduled for the third quarter of 2002.

Carolina West Wireless continues to actively work with vendors, PSAPs and the TTY Forum to ensure TTY availability as quickly as possible.

TTY Status Report: Second Quarter 2002

Cellular XL Associates, L.P.

July 10, 2002

Network Infrastructure Software Development

Cellular XL Associates, L.P. (Cellular XL) operates a Nortel Wireless 100 (W-100) hybrid wireless and wire line switch in its network. Nortel Networks has no TTY solution for the W-100 switch. To meet TTY requirements, Cellular XL and Nortel Networks have undertaken a project to split the wireless and wire line functionality into two separate switches – a DMS 100 wire line switch and a DMS-MTX wireless switch. Both switches must be in place before the DMS-MTX can be upgraded to the Nortel MTX10 software load required for proper TTY functionality.

Due to the extensive nature of this upgrade, Nortel Networks has informed Cellular XL that it will be unable to complete the upgrade until 4th quarter 2002. Although the software is generally available, Nortel has been focusing its installation efforts on large, nationwide carriers. Nortel has stated it will not complete the extensive software upgrade for Cellular XL before the fourth quarter of 2002. Therefore, Cellular XL has filed a one-year waiver with the FCC as it was unable to meet the compliance deadline of June 30, 2002.

Handset Development and Testing Plans

Cellular XL must rely on handset vendors to provide this solution. Cellular XL is gathering information from handset manufacturers and Nortel in its search for TTY-complaint handsets that Nortel deems compatible with its switch. Cellular XL has so far been unable to find such handsets, but is working with its vendors to acquire handsets as soon as possible.

Beta Testing and Lab Testing

Cellular XL is in contact with handset manufacturers and with Nortel Networks and will be gathering information on handsets Nortel deems compatible with its switch. Once Cellular XL has this information from Nortel, it will acquire handsets and test for compatibility and quality assurance in its own network.

Release and General Availability to Carriers of Network Infrastructure Software

Please see Nortel Networks' 2002 First Quarter Status Report for release and general availability information.

Availability to Carriers of Full Acceptance Test Unit

Cellular XL expects commitments from Nortel Networks to test the performance of their software solution prior to implementation

Efforts Toward Achieving Digital Wireless Solution Compatibility with Enhanced TTY Devices

Cellular XL has been working with Nortel to achieve compliance with several regulatory obligations, including TTY and E911 requirements. As stated above, it was determined that the wireless and wireline functionality of its hybrid switch had to be separated into two distinct switches: a DMS-100 wireline switch and a DMS-MTX wireless switch. Nortel originally told Cellular XL that the switch split would take place in January 2002. That date then slipped to June. Nortel now tells Cellular XL that the switch split will take place in August, at the earliest.

Testing and Deployment Activities

Once network TTY functionality is installed and Cellular XL has the handsets, Cellular XL will begin testing for compatibility and quality assurance within its own network. Presuming Nortel's completion of the switch split does not slip beyond August 2002 and its installation of the MTX10 software load takes place by the end of the fourth quarter, Cellular XL plans to test and deploy full TTY functionality throughout its entire 12-county service area by June 30, 2003.

Carrier Coordination of Testing with PSAP

Cellular XL has excellent relationships with the PSAP's in its service area and intends to utilize that relationship to assure complete communication functionality between handsets and PSAP's.

Carrier Testing Activities, Including Field Testing, Consumer End-To-End Testing, and other Necessary Tests

Cellular XL is a small carrier operating in two RSA's in South Mississippi. Once handsets have been acquired and network TTY functionality is installed, Cellular XL will begin testing. Testing will involve primarily three groups: Cellular XL engineers and technicians, PSAP representatives, and consumers. The University of Southern Mississippi has an active program assisting hearing-impaired people in this area and is one of many resources that will be utilized as a source of consumer test subjects.

Retail Availability of Necessary Consumer Equipment

Cellular XL intends to make consumer equipment available through all of its normal retail and direct sales outlets.

Geographic Scope of Network Infrastructure Deployment

Cellular XL operates its network in two relatively small RSA's in South Mississippi: MS 10 and MS 11. These two RSA's consist of 12 counties. Cellular XL will deploy the TTY solution over its entire network within this operating area.

TTY Contact:

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Project Manager
6184 US Highway 98 West
Hattiesburg, MS 39402
601.297.8881
dave@cellone-ms.com

July 8, 2002

To: TTY Forum

From: Susan Palmer and Ken Evans

TTY Forum #22 Report
Cingular Wireless LLC

Overview

Cingular Wireless LLC (Cingular) is pleased to report that as of June 28, 2002, its' digital network supports TTY as per the FCC mandate. TTY call testing was conducted in each switch in our network. Results of these test calls indicate that Cingular Wireless service will be provided in a highly reliable fashion with acceptable total character error rates (TCER). TTY compatible handsets are available from three manufacturers in both GSM and TDMA markets. Cingular has provided training and general TTY information to our sales people and the National Center for Cingular Customers with Disabilities. The National Center for Cingular Customers with Disabilities provides customer support via a direct TTY phone number 1-866-241-6567. This number is listed on Cingular Wireless website and bills next to the general, voice-based, customer care number. Cingular Wireless has also strongly encouraged its handset vendors to continue to design, develop and manufacture handsets that provide TTY access.

Cingular completed 6 weeks of testing of the TTY solution with deaf and hard of hearing TTY users. This testing was conducted to identify usability issues and to confirm that the necessary network, handset and customer interfaces are in place. A number of interface issues were identified and corrected prior to June 30, 2002. Some TTY and handset usability issues were referred to specific manufacturers to address in future models.

Going forward, Cingular will continue to participate in ATIS sponsored interoperability testing to insure cross network compatibility. This will include TTY Forum work with NENA and others to address the difficulties some PSAPs have with TTY signals over digital wireless networks.

USER TESTING

Cingular worked with the Rehabilitation Engineering Research Center at Gallaudet University, a nationally recognized Deaf research organization specializing in Telecommunications access, to insure that the TTY solution is viable. The evaluations at Gallaudet involved deaf individuals using the TTY products on a commercial switch to evaluate the network performance; usability of the interface to the wireless handset and the TTY terminal; and the customer service interface

provided via TTY and TRS. As a result of having real users try the service, several issues with customer service interface, Telecommunications Relay Service, usability of portable TTYs and handsets were identified and corrected. Cingular Wireless is grateful to Dr. Judy Harkins and her staff at Gallaudet for the valuable assistance they provided.

Corr Wireless Communications, L.L.C.

Corr Wireless has completed installing the necessary software into its switch.

Corr Wireless completed successful TTY test calls to the 911 centers in Blount County, Alabama and Cullman County, Alabama using a NOKIA 6360 TDMA phone and digital Compact/C TTY from Ultratec, Inc. Corr has not tested the unit in all PSAPs served by its system but is planning tests in all of them.

Network Infrastructure TTY Status for Ericsson Inc.

Second Quarter 2002 Report

July 10, 2002

This report details the TTY Network Infrastructure status provided by Ericsson Inc. at the June 4th, 2002 TTY Forum 22. This report identifies that all development and testing has been completed for all technologies (CDMA, TDMA and GSM). All network infrastructure products have been released to our customers and have achieved General Availability status.

Ericsson has completed the development of TTY technology intended for integration within its products. These products have been built to the approved ballot standards from the industry. The development testing has been completed for all of the Ericsson products, and the products have been demonstrated to the carriers in a number of test events within the FCC required deadlines. As products completed the development testing, they have also completed carriers' acceptance testing. In general, the technical feasibility to transport TTY across the digital cellular systems has been proven by the product operability testing. Results have been published for TDMA, GSM and CDMA infrastructure demonstrations although isolated technical flaws and system integration issues continue to be identified in the product test and carrier test phases.

While handset to infrastructure compatibility testing has taken place between several manufacturers, there continues to be an incurred risk to interoperability testing for manufacturers that have missed the initial testing. Identifying and resolving any outstanding performance objectives will require continued involvement and cooperation among the manufacturers, carriers, 911 PSAP facilities, standards organizations, and governing bodies. Ericsson continues to test TTY compatible products as needed, participate and monitor the industry standards and test events, and work with the regulatory bodies and the ATIS Incubator.

1) Network Infrastructure Development:

TDMA Status:

TDMA network infrastructure has completed product development and testing and has released a Package B of the TTY TDMA solution which includes the Positron Express and Nokia handset interoperability fixes.

TDMA Plans:

The Ericsson TDMA infrastructure has been Generally Available since April 3rd, 2002 and the product is being deployed.

GSM Status:

GSM network infrastructure has completed product development and system verification and the CTM node solution is complete. The GSM infrastructure solution FOA'd with Cingular in December 2001 and January 2002 and the software General Availability was achieved on February 25, 2002.

GSM Plans:

The Ericsson GSM TTY solution has been Generally Available since February 25th, 2002 and the product is being deployed.

CDMA Status:

Software code development for the network infrastructure solution is complete. Lab and integration tests are complete.

CDMA Plans:

The CDMA TTY commercial solution has been Generally Available since May 28th, 2002 and the product is being deployed.

2) Handset Development and Testing Plans;

Reported by Sony Ericsson.

3) Beta Testing and Lab Testing;**TDMA Infrastructure Beta Testing and Lab Testing**

Testing of the Positron problem and TTY_Silence was completed on March 1st, 2002.

GSM Infrastructure Beta Testing and Lab Testing

Ericsson lab test is complete. Terminal and PSAP testing have completed successfully. Error rates of less than 1-% have been demonstrated.

To date, there are no outstanding technical issues.

CDMA Infrastructure Beta Testing and Lab Testing

The TTY development Beta Testing and Lab Testing are completed and ready for commercial roll out. One final software load is kept in the Qwest ITC Lab for additional non-TTY related integration tests.

4) Release and General Availability to Carriers of Network Infrastructure Software;

The initial TDMA network software was declared General Availability (GA) on December 5, 2001. The new TDMA network software was declared GA on April 3, 2002.

The GSM System solution was declared General Availability (GA) with GSM R9.0, on February 25, 2002. Rollouts started in April 2002.

The CDMA TTY solution has been rolled out for Cricket market and ready to be rollout for other North American customers. The BSS Release 8.6 is scheduled to declare GA on July 12 for non-TTY related capabilities.

5) Availability to Carriers of Full Acceptance Test Units;

- *TDMA Network Infrastructure October 22, 2001*

- *New TDMA Network Infrastructure, March 4, 2002*
- *GSM Network Infrastructure November 30, 2001*
- CDMA Network Infrastructure was available on February 8, and completed on May 10, 2002.

6) Efforts Toward Achieving Digital Wireless Solution Compatibility with Enhanced TTY Devices.

Ericsson Inc. continues to support all other manufacturers and carriers on the TTY compatibility mandate.

7) Testing and Deployment Activities

Ericsson Inc. works with the operators/carriers in the test and deployment of network infrastructure systems. In addition, Ericsson Inc. works with the ATIS Incubator (TTSI) and participates in TTSI test events as scheduled.

Infrastructures for TDMA, GSM and CDMA have all attained General Availability and are now supported as released Ericsson products.

Ericsson Inc. would again like to express our appreciation for all of the test efforts and support we have received regarding TTY capability. Testing with operators, carriers, TTSI, Lucent, AWS, Cingular, DSPG, HITEC, Positron, and others contributed significantly to achieving the successes and results we have obtained so far.

8) Risks

The issue of continuing concern remains the issue of PSAP interoperability problems. The reality that these problems still have not been completely resolved poses an obstacle to the ability to provide 911 service over the wireless network. The wireless industry is interested in the commitment of both NENA and emergency services to assist with the resolution of this issue.

Outstanding issues are being circulated within the TTSI through the defined maintenance rollout effort.

Please feel free to contact Stephen Hayes if you have any questions regarding this report, or wish to contact test or product interfaces. Please contact your local customer interface for product sales and marketing information.

Midwest Wireless Holdings L.L.C
TTY Status Report
July 2, 2002

Background

Midwest Wireless Holdings L.L.C. is a rural carrier that operates TDMA digital Cellular service in its Minnesota, Iowa, and Wisconsin markets. Due to the complexity of this issue, Midwest Wireless is reliant on its switching vendor, Nortel Networks, for the necessary switch software, and the capabilities of products from our two major handset providers, Nokia and Motorola, in order for our company to be compliant.

Status

The TTY compliant Nortel switch software (MTX10) was purchased and installed in Midwest Wireless switching systems during May 2002. A limited quantity of compliant Nokia handsets are on hand, and the testing results to date have been positive. We believe that Midwest Wireless is currently compliant, and has met the June 30, 2002 deployment date.

Respectfully submitted
Gary Christopherson
Midwest Wireless Holding L.L.C.

July 8, 2002

Via Electronic Mail and Federal Express

Ed Hall
The Alliance for Telecommunications Industry Solutions
1200 G Street, NW
Suite 500
Washington, DC 20005

Dear Mr. Hall:

Motorola is pleased to submit our final status report related to implementation of TTY compatibility in our digital phones and infrastructure. Motorola is a domestic supplier of cellular handsets in TDMA, CDMA, GSM, and iDEN technologies. We also provide infrastructure equipment in CDMA and iDEN technologies.

We have worked closely with our carrier customers to provide them with the equipment necessary to meet the Federal Communications Commission's June 30, 2002 TTY deployment deadline. As of this report, Motorola has completed its efforts to enable these carriers to meet their obligations.

The attached report is provided to the TTY Forum for its report to the Commission for the second quarter of 2002. This will be our final report unless otherwise instructed by the Federal Communications Commission. Please contact me at the number below if you have any questions.

Regards

Rex Ellington
Senior Operations Manager
Product Safety & Compliance
Motorola – Personal Communications Sector
Voice: (815) 884-4315

Enclosure

MOTOROLA

TTY COMPATIBILITY DEVELOPMENT STATUS REPORT

2nd Quarter 2002

Product	Standard	Status	Milestones	Progress
CDMA Handset	IS 127-3 IS 733-2	Carrier deployment	IOT: June 2001 UI: October 2001 ROM: December 2001 SA: May 2002	Handset development work complete. V60i and V120c CDMA phones have been approved for shipment.
GSM Handset	TS 26.226 TS 26.230 TR 26.231	Carrier deployment	UI: October 2001 IOT: October 2001 ROM: January 2002 SA: July 2002	Handset development work complete. V60i GSM phone has been approved for shipment. P280i expected to be approved for shipment in July
iDEN Handset		Carrier deployment	Production handsets available to carriers.	Handset work complete.
TDMA Handset	IS 823-A IS 840-A	Carrier deployment	IOT: September 2001 UI: September 2001 ROM: October 2001 SA: April 2002	Handset development work complete. V60i and V120t TDMA phone has been approved for shipment.
CDMA Infrastructure	IS 127-3 IS 733-2	Carrier deployment	FOA Jan 02 Software release available	Carrier testing complete.
iDEN Infrastructure		Carrier deployment	Production software available to carriers	Infrastructure software available for carrier deployment.

Note: Motorola works with its carrier customers to provide them specific information related to their respective products.

Note: IOT is Inter Op Testing with RAM based parts for Character Error Rate testing
 UI is User Interface testing with HCO / VCO support
 ROM is the availability of ROM based phones. These should be functionally identical to a RAM phone.
 SA is Ship Acceptance of production volume quantities

Rex Ellington
 Product Safety & Compliance
 Motorola – Personal Communications Sector
 Phone: 815-884-4315



Nextel Communications, Inc.
2001 Edmund Halley Drive, Reston, VA 20191

July 10, 2002

Via Electronic Mail and Federal Express

Megan Hayes
The Alliance for Telecommunications Industry Solutions
1200 G Street, NW
Suite 500
Washington, D.C. 20005

Re: Nextel Communications, Inc. Second Quarter 2002 Report to the TTY Forum

Dear Ms. Hayes:

Pursuant to the Fourth Report and Order ("Fourth R&O") of the Federal Communications Commission ("Commission") in CC Docket No. 94-102,³ Nextel Communications, Inc. ("Nextel") hereby submits this final report on the status of its efforts to attain TTY accessibility on its iDEN handsets and national digital network. For several years, Nextel has worked closely with its vendor, Motorola, Inc. ("Motorola"), to research, develop and deploy TTY accessibility capabilities in the iDEN platform. Nextel is pleased to report that, as of June 30, 2002, six TTY-compatible iDEN handsets were available for use anywhere on Nextel's nationwide network.

Specifically, Nextel's i85s, i50sx, i55sr, i80s, i90c or i95cl are TTY compatible, and with the rollout of new software throughout Nextel's network, this TTY accessibility is available on these particular handsets in every Nextel market. To ensure that Nextel's customer base is aware of this new TTY capability, Nextel included a message in its July billing cycle announcing the launch of this new capability and specifying the handsets with which TTYs can be used.

Finally, although Nextel has successfully and timely launched the TTY capability in its network and handsets, Nextel continues to work with the Alliance for Telecommunications Industry Solutions ("ATIS") to find solutions to compatibility issues ATIS recently discovered in Public Safety Answering Point ("PSAP") TTY equipment. Due to the large number of TTY vendors, and their differing technologies and standards, ATIS discovered that some PSAP TTY equipment may have trouble receiving error-free calls from digital wireless handsets using TTY devices. Therefore, Nextel is working with ATIS to assist it in addressing this PSAP issue.

³ *In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Calling Systems*, Fourth Report and Order, CC Docket No. 94-102, FCC 00-436, released December 14, 2000 ("Fourth R&O").

Nextel appreciates the opportunity to provide this final report to the TTY Forum and is pleased to announce that its deployment of TTY capabilities in the iDEN network were completed prior to the Commission's June 30, 2002 deadline. If you have any questions about this report, please do not hesitate to contact me at 703-433-8315.

Sincerely,

Robert D. Montgomery
Senior Manager – Regulatory Technology Development

Enclosed is information regarding Nortel Networks plans to deliver a TTY solution in support of TDMA service providers' ability to meet the FCC TTY milestone objective.

- What is the status of TTY/TDD network infrastructure **software/hardware development and testing**?

Nortel response: Nortel Networks has completed development and testing activities regarding TDMA TTY/TDD functionality. End-to-end system validation within operator networks has also been completed. This TDMA TTY/TDD solution was tested to be compliant to IS-823A (TTY/TDD Extension to TIA/EIA 136-410 Enhanced Full Rate Speech Codec) for the EFRC Codec, and to IS-840. Nortel Networks has tested this feature with alpha/beta handsets from a few major vendors, which have all shown positive results*. We have also received TTY capable mobile handsets containing commercial TTY software from major vendors, which have shown excellent interoperability test results. Nortel Networks has also performed tests with a leading manufacturer of TTY/TDD (Teletypewriter /Terminal for Deaf Device) PSAP (Public Service Answering Point) equipment to ensure interoperability. Results of that specific testing were found to be positive.

Nortel Networks plans to support new and evolved standards in this year's next software releases. A more robust version of the TTY/TDD functionality is to be delivered within the MTX11 software release. MTX11/NBSS11 is scheduled to be generally available (GA) Q4 2002. This new TTY/TDD version has completed internal testing and has shown greatly improved robustness* when used with certain widely used, but older versions of PSAP equipment that may have issues fully meeting TTY standards.

Operators will be able to deploy Nortel Networks current TTY solution i.e. MTX10, which is based on the IS-823A and IS-840 standards, to meet the FCC deadline for implementation.

- For TTY/TDD what are the plans to work with any wireless carrier to perform **end-to-end customer tests**, and when will this occur?

Nortel response: The verification process with Nortel Networks lead customers for the MTX10 software version of the TTY/TDD functionality has completed as of January 2002. The Nortel Networks TTY/TDD solution showed TCER (Total Character Error Rate) of less than 1% in most cases and marginally exceeded 1% TCER in only the most strenuous RF and TTY/TDD test conditions. Nortel Networks used several different TTY mobile terminals during these test activities*. Please note the 1% TCER is not part of the FCC mandate.

A more robust version of the TTY/TDD functionality is to be delivered within the MTX11 software release, which begins end-to-end lead customer validation testing later this summer.

Operators are encouraged to request their handset vendors to test their commercial-grade TDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

***Nortel Networks acknowledges that the positive results of the TTY/TDD software feature is a direct function of the TTY/TDD equipment available to Nortel Networks and their lead customer verification partners at the time of TTY/TDD development, testing, and full network verification. Also note that some of the commercially deployed PSAP equipment, consumer TTY/TDD devices, and TTY/TDD capable digital mobile terminals will not comply with the same published standards from which Nortel Networks TTY/TDD solution was developed and tested. This reality will impact wireless operators who strive to deliver the best quality solution. Some operator effort will be required to procure the proper permutation of TTY/TDD equipment to inter-work with Nortel Networks TTY/TDD infrastructure software.**

Nortel Networks

- What is the Network infrastructure software/hardware **planned general availability dates** that support the deployment of this regulatory feature?

Nortel response: In order that wireless network operators may comply with the FCC's June 30, 2002 requirement for TTY/TDD implementation, Nortel Networks has made TTY/TDD enabling software available as follows:

Software load	TDMA SW general availability
MTX10 TDMA (incl. EDSPM)	Now Available (January 2002)

- What are the **hardware baseline and software baseline** to support TDMA TTY/TDD functionality?

Nortel response:

Regulatory solution required	TDMA HW/SW baseline
TTY/TDD	EDSPM SW for the ICP; MTX10 SW for the DMS-MTX** TTY capable handsets (3 rd party)

****Please note that the MSC itself must meet certain hardware requirements in order to upgrade to the MTX10 version of software e.g. processor speeds, memory size. These requirements were communicated to customers in the year 2000. Nortel Networks customer account team personnel churn related to Nortel Networks 2001 downsizing activities impacted some smaller customers. In these instances communication did not occur until Q2 2001.**

- What is the **schedule for deployment** of the software/hardware in the network?

Nortel Networks response: The minimum baseline software requirements for this functionality are given above. For questions related to scheduling its deployment into an operator's network, please contact Nortel Networks Product Deployment. Most of Nortel Networks U.S. TDMA customers (>50%) have already upgraded to MTX10 and are therefore TTY/TDD ready. Most of the *remaining* TDMA customers operate smaller networks and are currently showing plans to order and/or schedule a full network MTX10 upgrade after June 30, 2002. Many of these smaller customers that have yet to upgrade have significant hardware prerequisites to procure prior to being able to upgrade their MTX software baseline release. Many of these same operators have scheduled MTX10 for later this year, which is when these mitigating baseline issues delaying switch readiness are closed. Other operators may choose to migrate their networks to improved digital technologies e.g. CDMA or GSM. There is relatively small portion of rural cellular customers that from whom Nortel Networks has not received confirmation of upgrade plans.

Nortel Networks recommends that all customers who have not yet ordered and scheduled upgrade MTX10 to please contact Nortel Networks to ensure the most expeditious MSC upgrade.

Nortel Networks

- What are Nortel Network's plans to **test their own or other vendor handsets** with your switch solution?

Nortel Networks response: Nortel Networks provides only infrastructure for wireless networks. Nortel Networks does not provide mobile handsets. Nortel Networks recommends that the operator engage its handset vendor(s) in order to respond to the FCC regarding handset availability and interoperability test results with Nortel Networks infrastructure.

Operators are encouraged to request their handset vendors to test their commercial grade TDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

Please contact Gerry Chaparro for scheduling TTY testing in the Nortel Networks Wireless Interoperability Test Lab, where testing is based on current published standards (Phone: 972-684-4622; Fax: 972-684-3881; <mailto:chaparro@nortelnetworks.com>)

- **Contacts:**

Product Marketing	MTX10 SW	Kurt Raaflaub	(972) 685-2971
Product Management	TDMA TTY/TDD	Doug Kinnaird	(403) 769-8461
Regulatory	TTY/TDD	Charles Spann	(903) 852-6798
Product Deployment	MTX/NBSS SW	Mark Schwarzer	(972) 685-5851

Enclosed is information regarding Nortel Networks status to deliver TTY solutions to market in support of CDMA service providers' ability to meet FCC TTY milestone objectives.

- What is the status of TTY/TDD network infrastructure **software/hardware development and testing**?

Nortel Networks response: Regarding the MTX10/NBSS10.x release, Nortel Networks has completed development, product test and verification. Nortel Networks has completed internal testing using prototype and more recently using commercial mobile handsets with TTY capabilities from a few vendors, which have all shown positive results. Nortel Networks does not anticipate performance issues with any other vendor's handsets once they become available provided they are based on published standards. Nortel Networks has also performed tests with a leading manufacturer of TTY/TDD (Teletypewriter /Terminal for Deaf Device) PSAP (Public Service Answering Point) equipment to ensure interoperability. Results of that specific testing were found to be positive*. This completed TTY/TDD solution is based on standards: IS-127-2 (EVRC) & IS 733-1 (13K Vocoder). Operators will be able to deploy the Nortel Networks TTY solution based on these original standards IS-733-1, IS127-2 to meet the FCC deadline for implementation.

New revisions of these standards namely IS-127-3 (EVRC TTY) & IS-733-2 (13K TTY) have been published as of September 2001. Nortel Networks plans to support this new addendum to the standards in our next scheduled software release, MTX11/NBSS11, which is scheduled to be generally available (GA) Q4 2002. Product testing for this newer, more robust TTY/TDD software based on the revised CDMA standards is currently underway. The latest test results have shown, under a variety of test conditions, that the TCER (Total Character Error Rate) is less than a percent. These positive results have been repeatable when interoperating with mobile terminals with TTY capabilities from a variety of different vendors who could make their test phones available to Nortel Networks during the testing of this TTY enhancement. Nortel Networks did conclude during interoperability that a few mobile terminals were attributing to a higher than usual TCER due to TTY algorithms internal to those handsets being less than the most current version at the time of testing. These vendors have taken steps to update their mobiles to the latest code; therefore Nortel Networks foresees no issues with interoperability with those mobile terminals in the future.

- For TTY/TDD what are the plans to work with any wireless carrier to perform **end-to-end customer tests**, and when will this occur?

Nortel Networks response: The verification process for MTX10/NBSS 10.1.2 version of the TTY/TDD functionality with Nortel Networks lead customers was completed as of January 2002. The Nortel Networks TTY/TDD solution showed TCER of less than 1% in most cases and marginally exceeded 1% TCER in only the most strenuous RF and TTY/TDD test conditions*. Nortel Networks used several different TTY mobile terminals during these test activities. Please note the 1% TCER is not part of the FCC mandate.

A more robust version of the TTY/TDD functionality based on the revised CDMA standards is to be delivered within the MTX11/NBSS11.0 software release, which begins end-to-end lead customer validation testing later this summer.

Operators are encouraged to request their handset vendors to test their commercial-grade CDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

*Nortel Networks acknowledges that the positive results of the TTY/TDD software feature is a direct function of the TTY/TDD equipment available to Nortel Networks and their lead customer verification partners at the time of TTY/TDD development, testing, and full network verification. Also note that some of the commercially deployed PSAP equipment, consumer TTY/TDD devices, and TTY/TDD capable digital mobile terminals will not comply with the same published standards from which Nortel Networks TTY/TDD solution was developed and tested. This reality will impact wireless operators who strive to deliver the best quality solution. Some operator effort will be required to procure the proper permutation of TTY/TDD equipment to inter-work with Nortel Networks TTY/TDD infrastructure software.

- What is the Network infrastructure software/hardware **planned general availability dates** that support the deployment of this regulatory feature?

Nortel response: In order that wireless network operators may comply with the FCC's June 30, 2002 requirement for TTY/TDD implementation, Nortel Networks has made TTY/TDD enabling software available as follows:

Software load	CDMA SW general availability
MTX10/ NBSS10.x	Now Available (January 2002)

- What are the **hardware baseline and software baseline** to support CDMA TTY/TDD functionality?

Nortel Networks response:

Regulatory solution required	CDMA HW/SW baseline
TTY/TDD	NBSS10.x SW (BSS)** TTY capable handsets (3 rd party)

****Note:** NBSS10.x will operate with MTX09 software, however this configuration will only be supported for 30 days. NBSS software is only fully supported on the previous MTX software version as a step to upgrading to the most current MTX version. I.E. All customers require MTX10 software to not only maintain a supported NBSS10.x load, but to also enable the regulatory feature set contained in MTX10 e.g. CALEA, LNP, E911 phase 2.

Please also note that the MSC itself must meet certain hardware requirements in order to upgrade to the MTX10 version of software e.g. processor speeds, memory size. These requirements were communicated to customers in the year 2000. Nortel Networks customer account team personnel churn related to Nortel Networks 2001 downsizing activities impacted some smaller customers. In these instances communication did not occur until Q2 2001.

- What is the **schedule for deployment** of the software/hardware in the network?

Nortel Networks response: The minimum baseline software requirements for this functionality are given above. For questions related to scheduling its deployment into an operator's network, please contact Nortel Networks Product Deployment. The majority of Nortel Networks U.S. CDMA customers (>75%) has already upgraded to MTX10/NBSS10.x software and is therefore TTY/TDD ready. Most of the *remaining* CDMA customers are currently showing plans for MTX10/NBSS10 upgrade after June 30, 2002. Many of these smaller customers that have yet to upgrade have significant hardware prerequisites to procure prior to being able to upgrade their MTX and BSC baseline software version. Many of these same operators have scheduled MTX10/NBSS10.x release for later this year, which is when these mitigating baseline issues delaying switch readiness are closed. There are a relatively small number of rural cellular customers that from whom Nortel Networks has not received confirmation of their upgrade plans.

Nortel Networks recommends that all customers who have not yet ordered and scheduled upgrade MTX10/NBSS10.x to please contact Nortel Networks to ensure the most expeditious network upgrade.

- What are Nortel Networks **plans to test their own or other vendor handsets** with your switch solution?

Nortel Networks response: Nortel Networks provides only infrastructure for wireless networks. Nortel Networks does not provide mobile handsets. Nortel Networks recommends that the operator engage its handset vendor(s) in order to respond to the FCC regarding handset availability and interoperability test results with Nortel Networks infrastructure.

Operators are encouraged to request their handset vendors to test their commercial grade CDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

Please contact Cher Bruce for scheduling TTY testing in the Nortel Networks Wireless Interoperability Test Lab, where testing is based on current published standards (Phone: 972-684-2299; Fax: 972-684-3881; csbruce@nortelnetworks.com)

- **Contacts:**

Product Marketing	MTX10/NBSS10.x SW	Kurt Raaflaub	(972) 685-2971
Product Management	CDMA TTY/TDD	Maniam P	(972) 685-7203
Regulatory	E911Ph2&TTY/TDD	Charles Spann	(903) 852-6798
Product Deployment	CDMA NBSS SW	Mark Schwarzer	(972) 685-5851

Customer Response Template TTY/911 for GSM Systems
Date: 07-10-02 Version: TTYGSM002

Nortel Networks Solution Status- July 10th, 2002

Overview

Nortel Networks TTY Solution for GSM network consists of software for the BSS (applied on the Transcoding Unit (TCU)) and the Mobile Switching Center (MSC).

The TTY software for the BSS has been validated at a customer site and is commercially available since the end of May 2002 in the BSS V14.2d software release.

The TTY Software for the MSC has been validated at a customer site and is commercially available since March 2002 in the MSC NSS13 software load.

Baseline Software

MSC: NSS13, commercial availability date; Wk12 2002

BSS: V12.4d, commercial availability date; Wk 21 2002

Baseline Hardware:

MSC: SR70EM or XA-Core(3+1)

BSC: BSC/TCU12000

BTS: All BTS products

Summary of Inter-Operability Testing and Results

Nortel Networks has completed inter-operability testing with the following TTY terminals and device vendors.

- Motorola (TTY devices used: Q90 Ameriphone, Compact Ultratech, Ezcom Pro Ultratech)
- Ericsson (TTY devices used: Q90 Ameriphone, Compact Ultratech)
- Nokia (TTY devices used: Q90 Ameriphone, Compact Ultratech)

Nortel Networks demonstrated character error rates in compliance with the FCC target of less than 1%. These results were achieved with the devices mentioned above.

Verification results

Nortel Networks has completed development and testing activities regarding GSM TTY functionality. End-to-end system validation within operator networks has been completed May 2002, as part of the software verification. The GSM TTY solution was tested to be compliant with FCC requirements, and demonstrated character error rates in compliance with the target 1% error rate and in all cases lower than the 1% error rate.

Nortel Networks acknowledges that the positive results of the TTY software feature is a direct function of the TTY equipment available to Nortel Networks and their lead customer verification partners at the time of TTY development, testing, and full network verification.

Please direct all queries to-

GSM Americas PLM	Bruno Villa	(972)-684-0762
Regulatory	Charles Spann	(903)-852-6798

***Pine Belt Cellular, Inc.
3984 County Road 32
P. O. Box 279
Arlington, Alabama 36722***

TTY Report – July 10, 2002

Pine Belt Cellular, Inc. is completely reliant upon its vendors to implement the TTY solutions in its handsets and network. Pine Belt does not have the ability to independently verify the release dates of the solutions that will be provided by the vendors.

1.) Network infrastructure software development:

Lucent Technologies, our switch and infrastructure manufacturer is aware of the TTY requirements. Our understanding is that Lucent is currently working on software solutions at this time. Pine Belt is dependent upon Lucent providing these solutions.

2) Handset development and testing plans:

Pine Belt Cellular uses handsets made by a number of manufacturers. The manufacturers most predominantly used by Pine Belt are Motorola, Nokia, and Kyrocera. Pine Belt will stay abreast of the developments by these manufacturers so when TTY solutions are made available, we will be able to provide these units to our customers as soon as possible.

3) Beta testing and lab testing:

Pine Belt Cellular will begin testing TTY compatible equipment as soon as both our handset and infrastructure manufacturers provide solutions to us.

4) Release and general availability to carriers of network infrastructure software

Pine Belt Cellular is awaiting updated reports of software availability from switching and infrastructure vendors.

5) Availability to carriers of full acceptance test units:

Pine Belt Cellular is awaiting software and hardware availability from switching, infrastructure, and handset vendors.

6) Efforts toward achieving digital wireless solution compatibility with enhanced TTY devices:

Pine Belt Cellular remains dependent upon the availability of vendor provided solutions to meet the FCC's tentatively mandated timeline (12-31-01) to provide E911 TTY access to our networks.

7) Carrier coordination of testing with PSAP:

This testing target date is dependent upon solutions provided by network infrastructure vendors and handset vendors.

8) Carrier testing activities, including field testing, consumer end-to-end testing, and other necessary tests:

Testing will begin immediately upon receipt of software and hardware. Pine Belt Cellular is dependent upon network infrastructure vendor solutions.

9) Retail availability of necessary consumer equipment:

Pine Belt Cellular is dependent upon the availability of handsets from vendors. No firm commitment has been received at this time from handset vendors.

10) Geographic scope of network infrastructure deployment:

Pine Belt Cellular service area: Alabama RSA3B2 & BTA415

Sony Ericsson Mobile Communications TTY Forum #22 Report July 10, 2002

This report details the verbal presentation provided by Sony Ericsson Mobile Communications at the June 06, 2002 TTY Forum 22. The report identifies development and testing status for handset products, release and general availability dates, efforts towards achieving compatibility with TTY devices, system testing, deployment activities, technical issues, and contact information.

Sony Ericsson has completed the development of TTY technology. The handset products are built to the approved relevant standards. The release of acceptance products to the carriers has been completed. In general, the technical feasibility to transport TTY across the digital wireless systems has been proven by the product operability testing. Sony Ericsson has conducted field tests, interoperability tests, and final product verification tests for TTY test capability. Interoperability testing is being conducted within Sony Ericsson, and within the industry test events of TTSI within ATIS. User testing is underway. Education material and field training are underway.

Isolated technical flaws and system integration issues continue to be identified during the testing of TTY products and systems. The isolation and resolution of these issues will require testing at particular deployment sites, where performance has been observed to be an issue. Issues with GAP performance, IS-825 and IS-840 MPS (Minimum Performance Specifications), have been observed, primarily in CDMA infrastructures, while on mobile-to-mobile, and in some instances, mobile-to-land calls.

Sony Ericsson continues to actively develop and test existing and new TTY compatible products, participate and monitor the industry standards and test events, and work closely with the regulatory bodies and the ATIS TTSI Incubator. Sony Ericsson is closely monitoring the data generated by TTSI to determine compliance to the FCC mandated 1% TTY character error rate.

An issue with call completion status messages from the infrastructure to the TTY devices was raised as an issue with the ATIS IVR forum in April. The issue was moved to the IVR forum, which has raised the issue with ANSI. A draft request was created, to develop TTY character messages for "System Busy", "All Circuits Busy", and "The Number Cannot be Completed as Dialed". Characterization of these messages, and completion of the standardization efforts, has received excellent cooperation from all parties involved in this high priority effort.

9) Network Infrastructure Compatibility Evaluation : **TDMA Status:**

Sony Ericsson has tested interoperability by testing handsets with Lucent, Nortel, Ericsson, and others infrastructures. The Sony Ericsson T61D and T61LX TDMA handsets function with outstanding performance. The internal HCO/VCO feature has been user tested, and found to work very well.

GSM Status:

Sony Ericsson has tested the interoperability of infrastructures, by testing GSM handsets with Ericsson, Nortel, and Nokia and others infrastructures. The results have been outstanding in stationary and driving conditions. Tests of up to 70 MPH showed no significant error rates. HCO/VCO testing with the Ameriphone Q90D showed excellent results. Subsequent testing of GSM in Washington DC shows less than ideal performance, with mobile-to-mobile calls, with gapped TTY character data. An investigation is underway.

CDMA Status:

Sony Ericsson has tested the interoperability of infrastructures to validate CDMA handsets, with Ericsson, Lucent, and others infrastructures. Sony Ericsson identified and repaired all known issues with the handset design. Sony Ericsson has been able to produce valid test results on Lucent LiveNet and Lucent Infrastructures in Washington DC, and Ericsson CDMA infrastructures in San Diego CA. In interoperability testing with other manufacturers, it has been observed that performance in one city may not match performance in another city. Sony Ericsson has pressed ATIS to step up its role in CDMA infrastructure interoperability testing, to validate gapped character performance with all manufacturers.

10) Handset Development and Testing Plans:

Sony Ericsson TTY terminal products have completed development. Test data has been generated for CDMA, TDMA, and GSM products. Handsets were made available for manufacturer and carrier interoperability testing, and have been used at TTSI test events. The T61D (TDMA), and T61Z (GSM) handsets are commercially available. Soon to be released handset models include the T61C (CDMA) T206 (CDMA) and T68i (GSM).

TDMA Status

The handset performance received an excellent response. The T61D handset is in production.

TDMA Plans

Carrier acceptance test units were released. No known handset issues exist.

GSM Status

Infrastructure testing with ATT Wireless and Cingular are complete. Infrastructure testing with VoiceStream and Airnet are ongoing. The T61Z handset is in production.

GSM Plans

T-Link adapters are available in the Special Needs Center (www.ericsson-snc.com). Additional product development plans are in process.

CDMA Status

There are performance issues with several infrastructures, and in several cities. ATIS has been notified of the apparent issue with GAP testing data and reports. Additional lab and chipset software testing are proceeding. Customer and user testing in selected cities have shown that acceptable performance is possible to TRS centers.

CDMA Plans

Product improvements and new product plans are in process

11) Availability to Carriers of Full Acceptance Test Units;

- *TDMA handset Model T61D and T61LX were in production in June 2002.*
- *GSM handset Model T61z customer shipped in March 2002*
- *CDMA handset T60C customer shipped in March 2002.*

12) Efforts Toward Achieving Digital Wireless Solution Compatibility with Enhanced TTY Devices.

Sony Ericsson continues to work very closely with all manufacturers and carriers on the TTY compatibility mandate.

13) Testing and Deployment Activities

Sony Ericsson is working with the operators/carriers in the test and deployment of network infrastructure systems. In addition Sony Ericsson is working with the ATIS Incubator (TTSI), which continues to hold test events.

Sony Ericsson has been conducting customer education and user trials at SHHH, and NAD Conference events. Sony Ericsson has been working closely with the Sony Ericsson Special Needs Center, and is creating special education material for improving the use and access of its products to the marketplace.

6) Risks:

Performance of interoperability tests with TDMA has been widely successful. Performance of interoperability tests with GSM have been mostly successful, with an isolated failure in Washington DC on one carrier. Performance of interoperability tests with CDMA has been mostly problematic; with wide spread failures in most locations.

CDMA interoperability issues with infrastructures have proven to be an illusive target, even with advanced testing tools. Several infrastructure manufacturers have generated substandard test results when tested in configurations of TRS, 911, Mobile-to-Mobile and Mobile-to-Land, with performance tests of Gallaudet, IS-825, IS-840, IS-733, HCO/VCO, Noise, and GAP configurations. The seemingly good results of Fast Typist may indicate that the echo cancellers in the network systems may not be configured properly in all systems. The test data points to problems on Mobile-to-Mobile calls, where the phones, and other test elements have proven themselves in numerous situations. Interoperability in particular cities, and with certain infrastructures, continues to show isolated issues. Direct work to validate new Gallaudet GAP scripts, with various character constructs, have been undertaken to demonstrate these performance issues exist in TTSI interoperability tests. It is hoped that with additional scrutiny to software configurations and echo canceller parameters, all remaining infrastructures can be brought into compliance.

User tests with TRS systems have show very good results in Seattle TDMA and Washington TDMA CDMA. Additional user testing and reports are in process. Close observation to initial user reports could be helpful in validating system infrastructure compatibility. 911 system testing and compatibility issues have been handed to TTSI for further work, and Sony Ericsson continues to monitor the progress.

Please feel free to contact either Matt Kaltenbach or Steve Coston if you have any question regarding this report, or wish to contact test or product interfaces. Please contact your local customer interface for product sales and marketing information.

Southern LINC® TTY Status Report 2nd Quarter 2002

Southern LINC hereby submits its status report for 2nd Quarter 2002 in accordance with the reporting requirement contained in the Federal Communications Commission's *Fourth Report and Order* in CC Docket No. 94-102. Southern LINC is pleased to report that it completed implementation of TTY capability on its iDEN system in advance of June 30, 2002. This capability enables Southern LINC subscribers to connect TTY-capable handsets to TTY devices and complete calls on Southern LINC's network, including calls to 9-1-1. Southern LINC is a regional carrier providing service in Georgia and Alabama and portions of Florida and Mississippi. Its deployment of the iDEN TTY solution encompasses its entire network, and it currently offers multiple digital handsets that can be used with a TTY device on its system. Specifically, Southern LINC has undertaken the following steps since submitting its 1st Quarter 2002 status report:

- Southern LINC completed installation of all necessary network software upgrades to support TTY call completion.
- Southern LINC conducted testing of the iDEN TTY solution on its network, and all testing was successful. This testing included call-through testing on its network to a PSAP (Calhoun County, AL 9-1-1) using TTY devices connected to its handsets, and these calls were successfully completed. It is Southern LINC's understanding, however, that industry field-testing under the auspices of the Alliance for Telecommunications Industry Solutions-sponsored TTY Technical Standards Implementation (TTSI) Incubator program identified problems with the equipment used by some PSAPs that leads to an unacceptable character error rate for TTY calls. Southern LINC will continue to monitor this situation through the TTY Forum and will remain alert to any 9-1-1 TTY call problems that may arise with PSAPs within its service territory.
- Southern LINC prepared a communications piece for its customers for inclusion with their July bills. The bill insert informs Southern LINC subscribers of the ability to use TTY devices on the Southern LINC system. Southern LINC has also posted information on its Internet site.
- Southern LINC has conducted internal training to ensure that Southern LINC personnel have the necessary information to communicate with customers about using TTY devices to place calls on the Southern LINC system.

For questions regarding this report, please contact:

Holly Henderson
Regulatory Affairs Manager
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5555 Glenridge Connector, Suite 500
Atlanta, GA 30342

TTY Report to the FCC
On Behalf of Sprint PCS and its Network Managers
Prepared 7/10/02

NOTE: In a press release dated June 19, 2002, Sprint PCS announced the nationwide launch of its TTY service and the availability of six (6) TTY capable handsets.

1. *Network Infrastructure Software Development*

- Sprint PCS has received software from all of its network vendors. TTY infrastructure and handset interoperability testing has been completed.
- The TTY feature has been activated in Sprint PCS markets with Lucent, Nortel, Motorola and Samsung infrastructures
- Sprint PCS has completed additional laboratory testing on the latest iteration of Motorola's TTY solution which is expected to improve TTY performance with particular handsets. The network upgrades are expected to be completed in the August time-frame.
- Sprint PCS and other wireless carriers have encountered difficulties when testing the TTY feature with PSAPs, which may interfere with the ubiquitous support of the TTY feature in our network. Sprint PCS along with other wireless carriers has brought this matter to the attention of the FCC. With the FCC's approval, Sprint PCS launched TTY despite the PSAP problems. Sprint PCS is educating its customers about the difficulties that may be encountered when dialing 911 and suggest alternate means of making emergency calls (via TRS, analog mode, or landline phone). Sprint PCS will continue to support industry efforts to find a long term solution to the PSAP issue.

2. *Handset development and testing plans*

- SPCS has successfully tested handsets provided by five vendors and expect our remaining vendors to deliver TTY capable handsets from this point forth.
- Interoperability testing with all four infrastructure providers has been performed in a laboratory environment and in a field environment. Laboratory and field-testing will continue through the Sprint PCS nation wide launch and beyond.
- Sprint PCS has and will likely continue to encounter minor problems with handset models. Sprint PCS is receiving positive cooperation and support from handset vendors to fix the bugs quickly.

3. *Beta testing and lab testing*

- SPCS requires lab, field testing, and beta testing (in that order) prior to implementation. Our internal lab testing and field testing are extremely intensive and require approximately two to three months each.
- Both lab and field testing have been completed.
- SPCS has participated in the ATIS sponsored TTY Technical Standards Incubator (TTSI) program. Sprint PCS has also performed inter-technology testing with AMPS, TDMA, and CDMA wireless telephony systems yielding results consistent with other TTSI results.
- SPCS has also completed three live network user trials (beta test) with deaf/hard of hearing user groups.

4. *Release and general availability to carriers of network software*

- All network infrastructure vendors have provided software solutions for TTY.
- All network vendor's software has been released from Sprint PCS' lab and has gone "live" in the markets. Sprint PCS is, as noted above, preparing to launch new, improved Motorola infrastructure that will enhance TTY performance.

5. *Availability to carriers of full acceptance test units*

- See # 2

6. *Efforts toward Achieving digital wireless solution compatibility with enhanced TTY devices.*

- Sprint PCS is not pursuing a resolution of proprietary enhanced protocols as the FCC has temporarily relieved carriers of this responsibility. Sprint PCS will reevaluate enhanced protocols when industry standards supporting these protocols are in place.

7. *Carrier Coordination of testing with PSAP*

- While Sprint PCS has performed its own PSAP testing (in which it encountered mixed results), due to the nature of PSAP/E911 testing, it is relying mostly on ATIS' TTSI to coordinate more robust PSAP testing with the help of NENA and APCO.
8. ***Carrier testing activities, including field testing, consumer end-to-end testing***
- Sprint PCS has testing with a variety of consumers (including Gallaudet University) in various markets prior to nation-wide deployment.
 - Sprint PCS is actively participating in the ATIS TTSI program and will continue to participate in additional "incubator" field tests in which carriers and vendors perform interoperability tests.
 - Sprint PCS was the first American domestic carrier to perform TTSI supported international interoperability testing with participants from another continent (Ericsson CDMA Lab testing in Sao Paulo, Brazil).
 - Sprint PCS was also instrumental in working with ATIS TTSI and Sprint TRS to resolve a compatibility concern between TTY and TRS.
9. ***Retail availability of necessary consumer equipment***
- Several TTY capable handsets are available at Sprint PCS Stores now. The list of phones will increase steadily because Sprint is requiring that nearly all of its new handsets be TTY capable. Lists of available handsets can be found on Sprint PCS' web site. The methods of enabling the TTY feature will be available within handset user guides in the near future.
10. ***Geographic scope of network deployment***
- SPCS launched nationwide on June 19, 2002. All markets in all geographic areas are up and running.

<p style="text-align: center;">Unwired Telecom Report to the FCC Prepared: 6/17/02</p>
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1. *Network Infrastructure Software Development*

Unwired Telecom operates one Nortel switch and the required MTX 10 software upgrade was completed on June 6, 2002.

2. *Handset development and testing plans*

Unwired Telecom currently has a TDMA TTY compatible handset (Panasonic model # EB-TX310) available in stores. We will introduce additional models by the end of July 2002.

3. *Beta testing and lab testing*

Beta and lab testing was successfully completed on June 17, 2002.

4. *Carrier Coordination of testing with PSAP*

Unwired Telecom completed testing with the Calcasieu Parish, LA Communications District on June 17, 2002.

5. *Retail availability of necessary consumer equipment*

TTY capable handsets are now available in all Unwired Telecom stores.

6. *Geographic scope of network deployment*

Network deployment was completed on June 17, 2002.

7. *Efforts toward achieving digital wireless solution compatibility with enhanced TTY devices.*

Unwired Telecom is not pursuing a resolution of proprietary enhanced protocols as the FCC has temporarily relieved carriers of this responsibility.

8. *Carrier testing activities, including field-testing and consumer end-to-end testing.*

Field-testing and consumer end-to-end testing was completed on June 17, 2002.

9. *Release and general availability to carriers of network software.*

See # 1

10. *Availability to carriers of full acceptance test units*

The test unit used by Unwired Telecom is available from Ultratech.



Global Wireless by **T** · · Mobile ·

TTY Report for July 2002

Contact Information

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1. Purpose

This document describes VoiceStream's achievement of the FCC mandate, contained in 47 CFR Section 20.18, that operators of digital wireless systems must be capable of transmitting 911 calls from individuals with disabilities through the use of Text Telephone Devices (TTY). The rule requires compliance with this mandate on or before June 30, 2002. The capabilities that VoiceStream has achieved will also support the FCC's policy of full user-to-user functionality for persons with disabilities employing TTY devices. This document, which is for information purposes, is submitted to the TTY Forum of the Alliance for Telecommunications Industry Solutions (ATIS).

2. Executive Summary

VoiceStream uniformly employs the GSM air interface. Standardization work for a GSM TTY solution is complete and VoiceStream was active in facilitating testing and decisions that enabled 911 access as well as full user-to-user functionality. VoiceStream has deployed different solutions, depending on network and handset vendor and equipment type. VoiceStream uses network equipment from Ericsson, Nokia and Nortel in different geographical areas of the US. TTY-capable handsets from Ericsson, Motorola and Nokia are being evaluated. Initially the Ericsson T61z will be provisioned for TTY customers.

VoiceStream was instrumental in working with the global GSM community to get agreement on a common signaling mechanism applicable to both the Network Switching Subsystem (NSS) and Base Station System (BSS) solutions. Having obtained global community agreement on using bearer capability signaling, VoiceStream has been working diligently with its network equipment vendors to test and verify the performance of both the NSS and BSS implementations.

As of June 30, software loads were completed in virtually all of VoiceStream's 42 markets, comprising 359 base station controllers. The single exception comprises four BTAs associated with a license that VoiceStream only recently purchased in south-central Pennsylvania. The network equipment in those four markets is older and requires significant upgrades before it will be capable of supporting TTY. On June 28, 2002, the Commission's Wireless Telecommunications Bureau granted VoiceStream a waiver of the wireless TTY rule for an additional 75 days for the four BTAs. The markets involved serve less than 1.5 percent of VoiceStream's total subscribers.

VoiceStream has contracted with the HITEC Group -- a respected, two-decades old organization that works to help persons with disabilities to obtain assistive technology products -- to manage the distribution of TTY compatible handsets to VoiceStream customers.

3. Background

Since September 1997, the Wireless TTY Forum (TTY Forum), representing wireless carriers, wireless equipment manufacturers, manufacturers of TTY devices, public safety organizations, and consumer organizations representing individuals who are deaf or hard-of-hearing has been meeting in an effort to develop solutions that will enable TTY users to make 911 calls on digital wireless networks. Technical solutions had been proposed for all major wireless standards and these solutions have been undergoing study in the relevant technical bodies, TR45.5 (CDMA), TR45.3 (TDMA) and T1P1/3GPP (GSM).

The GSM solution uses the Cellular Text Telephony Modem (CTM) as a method of transmitting Baudot over the GSM network.

CTM solves the engineering challenge to transmit Baudot code over the digital channel of GSM at the FCC-mandated standard of a 1 percent Total Character Error Rate (TCER), as the digital codecs have been optimized for speech. Baudot uses frequency components at 1.4 and 1.8 KHz, which would have been attenuated by the low pass filtering in the codecs. In addition, the error correcting protocols of GSM normally would have resulted in the character error rate for a Baudot Code transmission increasing dramatically in the case of decreasing channel quality.

For this reason, CTM has been designed to work with all speech coding strategies and it has been successfully tested with the relevant codecs for the US, which are the GSM FR, EFR and all modes of the AMR codec. CTM signals have components only between 400 Hz and 1000 Hz, which corresponds to the natural range of human speech. A converter would handle the CTM functionality at the mobile, which would be either incorporated into the mobile or available as a clip-on/add-on unit.

The three documents specifying CTM have now been approved in the U.S. as American National Standards. These documents have also been submitted to 3GPP and have become the basis for the specifications developed by that group for all GSM systems worldwide.

TTY support in GSM networks has been formalized and is outlined in Technical Specifications- TS 23.002 and TS 23.226. TTY support is enabled using one of three solutions:

- The "all transcoder solution (All-TRAU)" with CTM on every circuit leading out to the terminals.
- The "CTM circuit pool solution" with a mechanism for selecting a circuit leading to the terminal that has the proper CTM detection/conversion capabilities, based on the terminal indicating that it has CTM capabilities.
- The "CTM-SRF [specialized resources function] service node solution" with a service node in the core network and a mechanism to route through it for CTM detection/conversion.

The GSM technical specifications require the support of Bearer Capability Signaling from the handset to the network for both the circuit pooling as well as service node solutions. This solution for a common signaling mechanism allows a handset to signal the network at call setup

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that it is sending a CTM call and thus the network can direct that call to a network path that can convert the CTM signal into Baudot.

Because the signaling mechanism is common to both the server as well as the circuit pooling solutions and is transparent to the All-TRAU solution, the wireless system operator can choose the equipment option that best fits its equipment implementation yet still maintain interoperability across platforms. The signaling mechanism is totally transparent to the user – that is, a TTY call can be made by any CTM-capable handset regardless of the network implementation utilized by the wireless system operator.

4. VoiceStream's Network Progress

VoiceStream has issued Purchase Orders totaling approximately \$5.5 million directly attributable to the initial deployment of TTY. Additional funds have been budgeted to cover any additional costs associated with the testing and deployment phases. VoiceStream has firm technical and commercial support from all three of its network equipment vendors.

Each vendor has chosen a slightly different implementation option based on its analysis of the ease and speed of the particular deployment solution.

Nokia	Implementing the All-TRAU solution which requires a software upgrade to all transcoder units. The software to support CTM/TTY is part of the company's S.10 release.
Nortel	Supporting the All-TRAU solution on the BSC E3 platform using the TCU E3 transcoder. CTM/TTY is supported in release 13.2. For the BSC 2G, Nortel is supporting the CTM circuit pooled solution requiring release 12.4D+.
Ericsson	Implementing the Service Node solution, using Telegent (Sweden) servers. The new servers are supported by the R9 BSC and MSC software releases.

Irrespective of the implementation option chosen by the vendor, the process for testing the CTM/TTY functionality proceeded as outlined below.

Laboratory Functional Testing (LFT) - Testing of the CTM functionality as a stand-alone function was performed in a controlled environment. The aim of this testing was to confirm that the CTM translation is correct and that the CTM/TTY functionality is able to meet the defined GSM and FCC requirements.

Laboratory Acceptance Tests (LAT) - Testing of the full end-to-end functionality of the new software and hardware needed to support TTY, including regression tests of basic GSM features such as voice call completion, GPRS call completion etc, to ensure that software changes did not introduced unforeseen errors in other blocks of code.

Soak Test (ST) - A stability period to ensure that software and hardware was stable and is able to operate in a normal loaded condition.

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First Office Application (FOA) - Limited deployment in the live network, to ensure that no unforeseen problems occurred that was not be observed in the laboratory.

General Acceptance (GA) - Full deployment to all relevant network nodes.

The table below shows the start dates for each of the phases of the test and verification program. The program shows the testing dates and the initiation of national deployment (GA).

Table 1: Test and Verification Dates

	LFT	LAT	ST	FOA	GA
Nokia	01/24/02	02/18/02	04/22/02	04/15/02	06/28/02
Nortel 2G BSC	04/01/02	04/11/02	04/18/02	05/01/02	06/28/02
Ericsson	01/26/02	02/15/02	02/25/02	03/27/02	05/15/02

Testing and verification has included end-to-end testing with a selection of PSAPs in various markets. In the course of the testing, VoiceStream engineers used various combinations of available TTY equipment such as the Compact C and TextLink 9100 TTY keyboards, the Ericsson 300z and T61z, Motorola P280i, and Nokia Gate mobile phones. The scoring of transmissions was done with Gallaudet software running on laptop PCs. While conducting the tests, VoiceStream was able to transmit those calls to the PSAP, although problems did arise due to the inability of some PSAPs to process the calls.

5. VoiceStream's Handset Availability

TTY-capable handsets interoperable over all infrastructures will be available upon customer request. VoiceStream has contracted with the HITEC Group to provision TTY capable phones to our subscribers. HITEC also has the ability to provide additional TTY equipment that is compatible with the TTY capable phones. The Ericsson T61z TTY-capable handset will be provisioned to customers. HITEC is a well-known organization with a history of working with persons with disabilities by provisioning a wide range of assistive communications devices. HITEC will ship the necessary equipment directly to the customer. The shipment will include a VoiceStream customer contract. Upon receiving a signed contract from the customer at a VoiceStream retail store, VoiceStream will activate the customer's service.

6. Conclusion

VoiceStream has met the June 30, 2002 deadline for provision of wireless TTY access to 911 emergency services, consistent with the Commission's mandate and the June 28, 2002 waiver providing the limited additional time necessary for compliance in one small geographic area. . VoiceStream cautions, however, that some concerns remain concerning the ability of Public Safety Answering Points (PSAPs) to process wireless 911 TTY calls. These processing problems manifest in relatively high character error rates. As documented by the ATIS-sponsored TTY Technical Standards Implementation (TTSI) Incubator, the problem may be limited to older, non-standardized TTY equipment and software used by some PSAPs.

